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Indoor Air Quality and Vapor Intrusion Assessment: Report of Second Sampling Round Results

Residence, Parcel 26/ 05/ 04
Wells G&H Superfund Site
Woburn, Massachusetts

August 2011

Submitted to:
United States Environmental Protection Agency Region 1
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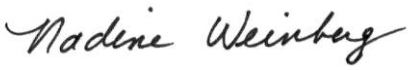

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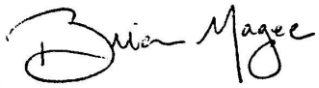

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Our Ref.:
MA000989.0002

Date:
August 2011

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1. Introduction

On behalf of UniFirst Corporation (UniFirst), ARCADIS has prepared this Indoor Air Quality and Vapor Intrusion Assessment: Report of Second Sampling Round Results for sampling conducted on June 16-17, 2011 at the residential property in Woburn, Massachusetts, identified in the tax assessors' records as Woburn Parcel Number 26/ 05/ 04 (the Residence). ARCADIS conducted sub-slab soil vapor, indoor ambient air, and outdoor ambient air sampling at the Residence during June 2011. All work was completed in accordance with the *Vapor Intrusion Assessment Work Plan* (*Work Plan*) approved by the U.S. Environmental Protection Agency (USEPA) on February 17, 2011 (ARCADIS 2011a).

As stated in the *Work Plan*, USEPA requested the collection of sub-slab soil vapor, indoor air, and ambient air samples from certain residential and commercial properties located on Olympia Avenue, Oregon Avenue, and Marietta Street (Study Area). The Residence is one of the properties that USEPA identified for study. The *Work Plan* was submitted to and approved by USEPA to establish the sampling methods and procedures to be followed. The objectives of the sampling were to:

- Measure concentrations of volatile organic compounds (VOCs) in sub-slab soil vapor and indoor air at each property identified for study by USEPA in the Study Area; and

- Measure concentrations of VOCs in outdoor air near these properties to evaluate atmospheric conditions at the time of indoor air sample collection.

The results of the second round of vapor intrusion sampling, sampling methodology, a discussion of the sampling results including a preliminary human health risk evaluation, and recommendations for future actions are provided below. A comparison of results from both the first sampling round (March 11-12, 2011) and the current (second) sampling round (June 16-17, 2011) is also presented.

2. Sampling Program

Consistent with the *Work Plan* (ARCADIS 2011a), ARCADIS collected a second round of sub-slab soil vapor, indoor air, and ambient air samples from the Residence on June 16-17, 2011. Specific sampling methodologies were consistent with the *Indoor Air Quality and Vapor Intrusion Assessment Scope of Work – Revision 2* (*SOW*) (JCO 2010a), the *Quality Assurance Project Plan – Revision 1* (*QAPP*) (JCO 2010b), and the

previous sampling round. Pre-sampling activities, sampling methodologies, and sample locations are described below. Sample logs are provided in Appendix A.

2.1 Pre-Sampling Activities

Prior to sampling, ARCADIS, in coordination with the USEPA, was granted access to the Residence from the current property owner. ARCADIS conducted a site reconnaissance prior to identify the building and foundation condition, building materials, heating, ventilation, and air conditioning (HVAC) operation, and potential preferential vapor migration pathways (i.e., sump pump, floor drains, cracks, etc.). A product inventory was completed to list items observed in the building that may contain VOCs that could potentially interfere with sample results, and identified VOC-containing products that could be removed were taken out of the basement of the Residence prior to sampling.

During the building survey the following potential background sources were identified:

- Field staff noted a car in the garage that is connected to the home. This likely a source of concentrations of the petroleum constituents benzene, ethylbenzene, toluene, xylenes (BTEX), naphthalene, and 1,2,4-trimethylbenzene subsequently detected in indoor air.

- The home owner is a known smoker and during a previous sampling round was seen smoking a cigarette in the basement of the home. Cigarette smoke may be a source of benzene, toluene, 1,3-butadiene, and naphthalene (http://www.epa.gov/ttnatw01/hlthef/).

- Bottles of bleach were noted in the basement during the site visit which may be sources of chloroform via reactions with other cleaning products (Odabasi 2008).

The heating oil leak seen near the furnace during the March 2011 sampling event has since been repaired, and no visible heating oil leak was observed during the June 2011 sampling event. Since indoor air sampling was conducted only in the basement, the survey was not extended to the first floor or garage, but additional background sources of some chemicals were observed in those areas. As feasible, products were containerized and removed from the basement of the Residence approximately 48 hours prior to sampling. The building survey and product inventory can be found in Appendix B.

2.2 Indoor Ambient Air Assessment

On June 16, 2011, indoor air samples were collected from two locations on the basement level of the Residence. All indoor air samples were co-located with the installed sub-slab soil vapor points and were consistent with the previous round of sampling. One duplicate indoor air sample was also collected from the residence as a quality control measure.

Sample methods were consistent with the *SOW* (JCO 2010a) and *QAPP* (JCO 2010b). Samples were collected from the breathing zone (3 to 4 feet above ground surface) above each sub-slab soil vapor location. To avoid any cross contamination issues with potential vapors under the floor slab, indoor air samples were collected prior to sub-slab soil vapor samples. To ensure a reasonable worst case scenario, indoor air sampling was conducted with all exterior building doors closed to avoid any dilution with outside air.

Samples were collected over a 24-hour period in individually certified six-liter passivated sample canisters provided by Alpha Analytical, Inc. of Mansfield, Massachusetts (Alpha), a National Environmental Laboratory Accreditation Conference (NELAC) (E87814) certified laboratory. Canisters were analyzed for VOCs by USEPA Method TO-15 featuring selective ion monitoring (SIM). Detailed sample collection methods are included in the *SOW (JCO 2010a)* and in SOP-JCO-063 contained in the *QAPP* (JCO 2010b). Sample logs from indoor air sampling are included in Appendix A.

2.3 Outdoor Ambient Air Assessment

On June 16, 2011, one outdoor air sample was collected from an upwind location outside the Residence using the same methods as described for indoor air samples. The sample was collected to understand what contribution the ambient environment may have on indoor air samples collected from inside the building. Sample locations are presented in Figure 1. The outdoor ambient air and indoor air samples were collected over approximately the same 24-hour time period with the outdoor sample being started immediately prior to the indoor air samples. Sample logs from ambient air sampling are included in Appendix A.

2.4 Sub-Slab Soil Vapor Assessment

One permanent sub-slab soil vapor sample point was installed in the basement of the Residence on March 5, 2011 (Figure 1). The installation method for this point was

previously reported in the *Work Plan* and the Indoor Air Quality and Vapor Intrusion Assessment (ARCADIS 2011a, b). The other sub-slab soil vapor sample point was a temporary point and was installed immediately prior to sampling on June 17, 2011. A temporary point was used due to the thin (1-inch) concrete encountered in one section of the basement.

At the completion of the indoor air sampling on June 17, 2011, sub-slab soil vapor samples were collected from two locations in the Residence. The integrity of each sample port was tested using a helium tracer test. These methods were presented in the *Work Plan* (ARCADIS 2011a).

Prior to sampling, three volumes of the sample tubing were purged utilizing a low-flow pump to remove any ambient air from the sampling train. Detailed methods for sampling are included in SOP-JCO-062 contained in the *QAPP* (JCO 2010b). Samples were collected over a 30-minute period in individually certified six-liter passivated sample canisters provided by Alpha. Canisters were analyzed for VOCs by USEPA Method TO-15 featuring SIM. Sample logs from sub-slab soil vapor sampling are included in Appendix A.

Upon the completion of the second round of sub-slab soil vapor sampling (June 17, 2011) the one permanent sub-slab soil vapor point was removed. The point was removed from the floor slab using a chisel, hammer, and pry-bar. After removing the sampling point, the drilled hole was vacuumed out and filled with hydraulic cement. The temporary point was abandoned in a similar fashion as the drilled hole and was filled with hydraulic cement.

2.5 Data Synthesis and Reporting

Analytical data packages generated by the laboratory were validated by Phoenix Chemistry Services according to national guidelines for tier III data validation as described in the *SOW* (JCO 2010a) and *QAPP* (JCO 2010b). The data review included: field documentation, proper holding times, proper chain-of-custody documentation, achievement of target reporting limits, acceptable laboratory calibrations and quality control parameters, and representativeness of duplicate results.

Findings of the validation effort resulted in the following qualifications of sample results:

- Results for 1,3-butadiene, methyl tert-butyl ether (MTBE), toluene, ethylbenzene, and naphthalene in all samples were qualified as estimated (J, UJ).

- Results for methylene chloride in IA-1 and its duplicate were qualified as estimated (J).

Quality control results, including any revisions or qualifiers deemed necessary, are included in Tables 1 and 2. The data validation report is included in Appendix C. The laboratory analytical data package is included in Appendix D.

3. Results and Discussion

This section presents results for indoor air, outdoor ambient air, and sub-slab soil vapor samples collected from the Residence including a summary evaluation of potential human health risks. A copy of the complete Preliminary Human Health Risk Evaluation can be found in Appendix E.

3.1 Indoor and Outdoor Ambient Air Sampling Results

Analytical data for indoor and outdoor ambient air samples are presented on Table 1. The following compounds were detected in both indoor air samples: 1,2,4-trimethylbenzene, 1,2-dichloroethane, 1,3-butadiene, benzene, carbon tetrachloride, chloroform, ethylbenzene, naphthalene, tetrachloroethene (PCE), toluene, and xylenes. Methylene chloride, 1,4-dichlorobenzene, and trichloroethene were detected in location IA-1, but were not detected at location IA-2. Detected concentrations of these constituents are presented in Table 1.

The following constituents were detected in the outdoor ambient air sample: 1,2,4-trimethylbenzene, benzene, carbon tetrachloride, chloroform, ethylbenzene, naphthalene, toluene, and xylenes. Detected concentrations of these constituents are presented in Table 1.

A comparison of the data indicates that several constituents were detected in both outdoor and indoor air. Carbon tetrachloride was measured at similar concentrations in indoor and outdoor air. Although 1,2,4-trimethylbenzene, benzene, chloroform, ethylbenzene, naphthalene, toluene, and xylenes were detected in both outdoor and indoor air, concentrations were slightly greater in indoor air compared to outdoor ambient air.

3.2 Sub-Slab Soil Vapor Sampling Results

Analytical data for sub-slab soil vapor are presented in Table 2. The following compounds were detected in both sub-slab soil vapor samples: 1,1,1-trichloroethane, 1,2,4-trimethylbenzene, carbon tetrachloride, and PCE. Three constituents were only detected in one sub-slab soil vapor sample. Chloroform was only detected in SS-1; toluene and xylenes were only detected in sample SS-2. The full list of detected constituents and their concentrations are presented in Table 2.

3.3 Evaluation of Indoor Air and Sub-Slab Soil Vapor Results

The data results for indoor air and sub-slab soil vapor were evaluated together to determine if indoor air samples were associated with a potential background source. As a first step, attenuation factors (AFs) were calculated to evaluate if chemicals present in indoor air are potentially associated with sub-slab soil vapor levels, or if chemicals may be attributable to background sources. The AF is the ratio of indoor air to sub-slab soil vapor results and was calculated when a constituent was detected in both indoor air and sub-slab soil vapor. AFs close to or greater than one indicate that indoor air concentrations are equal to or higher than sub-slab soil vapor concentrations and therefore, that a background source likely is present. Of the 14 chemicals detected in indoor air, AFs could be calculated for six chemicals. The following five chemicals had AFs greater than one: 1,2,4-trimethylbenzene, carbon tetrachloride, chloroform, toluene, and xylenes. As a result, the presence of these chemicals in indoor air is attributable to background sources and not soil vapor intrusion. The calculation of AFs is presented in Table 2 of Appendix E.

Second, the data were evaluated to identify constituents that were detected in indoor air, but not sub-slab soil vapor. These results indicate a background material is the only source of the detected indoor air concentrations. The following constituents were identified as having background sources based on this criterion: 1,2-dichloroethane, 1,3-butadiene, 1,4-dichlorobenzene, benzene, ethylbenzene, methylene chloride, naphthalene, and trichloroethene.

Third, the results of indoor air and outdoor air samples were compared. Carbon tetrachloride was measured at a similar concentration in both outdoor and indoor air. These results indicate background sources are present in outdoor ambient air. Although 1,2,4-trimethylbenzene, benzene, chloroform, ethylbenzene, naphthalene, toluene, and xylenes were detected in both outdoor and indoor air, concentrations were slightly greater in indoor air compared to outdoor ambient air. These results,

however, are consistent with the observation of a vehicle parked in the attached garage.

PCE was detected in indoor air at a lower concentration compared to the co-located sub-slab soil vapor samples. Sub-slab soil vapor therefore may be a contributing source of PCE detections in indoor air. PCE was detected in indoor air samples in the Residence at concentrations between 0.739 and 0.841 µg/m^3. These results are consistent with background sources throughout the United States and are below the MADEP TV for PCE (1.4 µg/m^3). USEPA's indoor air background database reported a 50th percentile value of 0.7 µg/m^3, a 75th percentile value of 1.4 µg/m^3, and a 90th percentile value of 3.8 µg/m^3 (Dawson 2008).

According to MADEP, when constituents of concern are measured in indoor air at levels that are below TVs, it can reasonably be concluded that a complete vapor intrusion pathway does not exist.

3.4 Residence Human Health Risk Evaluation

Preliminary human health risk calculations were performed using the June 17, 2011 validated indoor air data and a combined data set (i.e., average indoor air concentrations) from the March 2011 and June 2011 sampling events. The Preliminary Human Health Risk Evaluation Report and supporting calculations can be found in Appendix E. The conclusions from that report are summarized below.

Potential risks from inhalation of constituents detected in indoor air were calculated assuming a homebound individual lives in the Residence for 24 hours per day, 350 days per year, for 30 years. For each constituent, the exposure point concentration in indoor air is equal to the average concentration of the two indoor air results from the current sampling round.

To evaluate potential risks over the initial (March 2011) and current (June 2011) sampling events, risks were calculated considering chemicals detected in indoor air from both sampling rounds. Data from March 11 and 12, 2011 were presented in the Indoor Air Quality and Vapor Intrusion Assessment: Report of Results submitted to USEPA on April 29, 2011 (ARCADIS 2011b). Any constituent that was detected in either the March or June sampling events in indoor air was included in the combined risk calculation. Risks were estimated using the average concentration from both sampling rounds. Risks associated with both data sets are referred to as "Combined Results" below.

The estimated total cancer risk associated with long term Residential exposure to indoor air in the basement of the home from the June 2011 sampling round is $4x10^{-5}$, primarily due to the presence of chloroform and naphthalene (72% of risk). Excluding chloroform and naphthalene, all other chemical-specific risks, including those associated with background sources, are below or equal to a $2x10^{-6}$ risk level for the current sampling round. Estimated cancer risk from PCE is equal to $2x10^{-6}$.

The estimated total cancer risk associated with long term residential exposure to indoor air in the basement of the Residence using the combined data set is $4x10^{-5}$, primarily due to the presence of benzene, chloroform, and naphthalene (76% of risk). The majority of risk associated with benzene, chloroform, and naphthalene is likely from background sources. Excluding these three chemicals, all other chemical-specific risks, including those associated with PCE, are below or equal to a $3x10^{-6}$ risk level for the combined data set. Estimated cancer risk from PCE using the combined data set is equal to $2x10^{-6}$.

4. Summary and Conclusions

The potential carcinogenic risk level estimated for a resident exposed for 30 years to the low levels of PCE (from the June 2011 sampling event) at the Residence is $2x10^{-6}$. This represents a level of risk that is at the most conservative end of USEPA's risk range for Superfund sites. The estimated total risk, including exposure to other constituents in the Residence originating from background sources is $4x10^{-5}$, primarily due to chloroform and naphthalene. As noted above, estimated cancer risks for PCE are the same for this sampling event (June 2011) and the combined data results ($2x10^{-6}$). This is also true for the overall risk calculations; the second sampling round risks and combined risks are both equal to $4x10^{-5}$.

The low concentrations of PCE detected in the basement of the Residence are consistent with those typically measured in residences, as reported by USEPA and MADEP. Measured PCE concentrations from both March and June 2011 are below the MADEP TV of 1.4 $\mu g/m^3$. According to MADEP, when constituents of concern are measured in indoor air at levels that are below TVs, it can reasonably be concluded that a complete vapor intrusion pathway does not exist.

5. Recommendations

The two rounds of sub-slab soil vapor and indoor air data collected in March and June 2011 from the basement of the Residence confirm that risks to residents are within

USEPA's risk range for Superfund sites. Estimated risks from exposure to constituents detected in indoor air are due primarily to background sources from products used and stored in the Residence. Estimated risks from exposure to PCE are just above USEPA's $1x10^{-6}$ risk threshold. Moreover, PCE concentrations in indoor air are less than background values including the MADEP TV of 1.4 µg/m^3. Based on these findings, no further action is recommended to address the vapor intrusion pathway at the Residence.

6. References

ARCADIS, 2011a. Vapor Intrusion Assessment Work Plan: Off-Site Sub-slab and Indoor Air Evaluation, Wells G&H Superfund Site, Woburn, Massachusetts, January 7.

ARCADIS. 2011b. Indoor Air Quality and Vapor Intrusion Assessment: Report of Results. Residence, Tax ID 26/ 02/ 06, Wells G&H Superfund Site, Woburn, Massachusetts. April 2011.

Dawson, Helen. 2008. Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences. Literature Review & Implications for Vapor Intrusion Assessment. Vapor Intrusion Workshop – AEHS Spring 2008, San Diego, California.

Massachusetts Department of Environmental Protection (MADEP). 2008. Massachusetts Contingency Plan, 310 CMR 40.0000. Bureau of Waste Site Cleanup. February.

Odabasi, M., 2008. Halogenated Volatile Organic Compounds from the Use of Chlorine-Bleach-Containing Household Products. Environ. Sci. Technol. 42:1445-1451.

The Johnson Company (JCO). 2010a. Indoor Air Quality and Vapor Intrusion Assessment Scope of Work, Revision 2, UniFirst Property, Wells G&H Superfund Property. March 25.

JCO. 2010a, Quality Assurance Project Plan, Revision 1, Indoor Air Quality and Vapor Intrusion Assessment, UniFirst Property, Wells G&H Superfund Property. March 25.

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Table 1. Indoor and Ambient Air Sampling Results - Residence

Sample Name: Date Collected:	Units	IA-1 6/17/2011	IA-2 6/17/2011	AA-1 6/17/2011
1,1,1-Trichloroethane	µg/m^3	0.109 U [0.109 U]	0.109 U	0.109 U
1,1,2-Trichloroethane	µg/m^3	0.109 U [0.109 U]	0.109 U	0.109 U
1,1-Dichloroethane	µg/m^3	0.081 U [0.081 U]	0.081 U	0.081 U
1,1-Dichloroethene	µg/m^3	0.079 U [0.079 U]	0.079 U	0.079 U
1,2,4-Trimethylbenzene	µg/m^3	1.48 [1.56]	1.26	0.27
1,2-Dibromoethane	µg/m^3	0.154 U [0.154 U]	0.154 U	0.154 U
1,2-Dichloroethane	µg/m^3	0.138 [0.138]	0.13	0.081 U
1,2-Dichloropropane	µg/m^3	0.092 U [0.092 U]	0.092 U	0.092 U
1,3-Butadiene	µg/m^3	0.106 J [0.108 J]	0.15 J	0.044 UJ
1,3-Dichlorobenzene	µg/m^3	0.12 U [0.12 U]	0.12 U	0.12 U
1,4-Dichlorobenzene	µg/m^3	0.168 [0.12 U]	0.12 U	0.12 U
Benzene	µg/m^3	0.732 [0.767]	0.728	0.316
Bromodichloromethane	µg/m^3	0.134 U [0.134 U]	0.134 U	0.134 U
Bromoform	µg/m^3	0.207 U [0.207 U]	0.207 U	0.207 U
Carbon Tetrachloride	µg/m^3	0.447 [0.472]	0.459	0.453
Chlorobenzene	µg/m^3	0.092 U [0.092 U]	0.092 U	0.092 U
Chloroform	µg/m^3	0.591 [0.571]	0.493	0.137
cis-1,2-Dichloroethene	µg/m^3	0.079 U [0.079 U]	0.079 U	0.079 U
Ethylbenzene	µg/m^3	0.738 J [0.747 J]	0.734 J	0.2 J
Isopropylbenzene	µg/m^3	2.46 U [2.46 U]	2.46 U	2.46 U
Methyl tert-butyl ether	µg/m^3	0.072 UJ [0.072 UJ]	0.072 UJ	0.072 UJ
Methylene Chloride	µg/m^3	21.1 J [2.78 J]	1.74 U	1.74 U
Naphthalene	µg/m^3	1.8 J [1.8 J]	1.45 J	0.142 J
Tetrachloroethene	µg/m^3	0.746 [0.841]	0.739	0.136 U
Toluene	µg/m^3	5.28 J [5.54 J]	4.22 J	1.22 J
trans-1,2-Dichloroethene	µg/m^3	0.079 U [0.079 U]	0.079 U	0.079 U
trans-1,3-Dichloropropene	µg/m^3	0.091 U [0.091 U]	0.091 U	0.091 U
Trichloroethene	µg/m^3	0.107 U [0.14]	0.107 U	0.107 U
Vinyl Chloride	µg/m^3	0.051 U [0.051 U]	0.051 U	0.051 U
Xylenes (total)	µg/m^3	3.09 [3.25]	3.1	0.908

Notes:

U - Constituent not detected

J - Indicates an estimated value

µg/m^3 - micrograms per cubic meter

[0.109 U] - duplicate results presented in brackets

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Table 2. Sub-Slab Soil Vapor Sampling Results - Residence

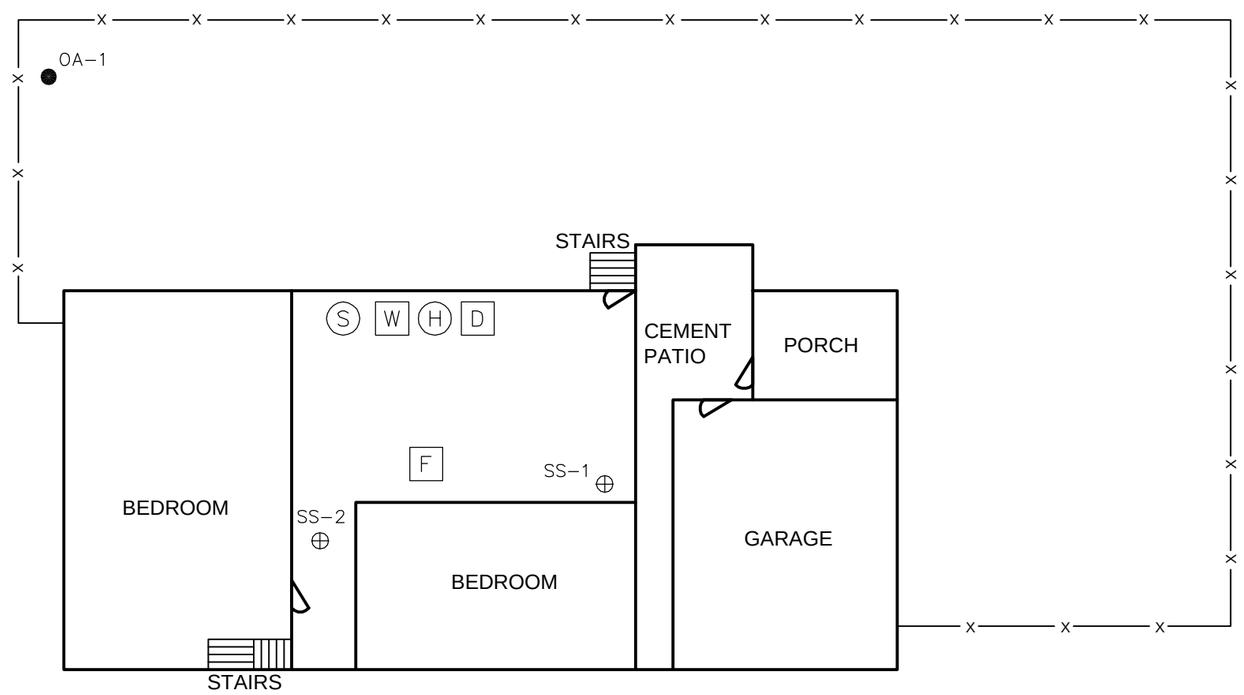
Sample Name: / Date Collected:	Units	SS-1 6/17/2011	SS-2 6/17/2011
1,1,1-Trichloroethane	µg/m^3	0.153	0.147
1,1,2-Trichloroethane	µg/m^3	0.109 U	0.109 U
1,1-Dichloroethane	µg/m^3	0.081 U	0.081 U
1,1-Dichloroethene	µg/m^3	0.079 U	0.079 U
1,2,4-Trimethylbenzene	µg/m^3	0.118	0.192
1,2-Dibromoethane	µg/m^3	0.154 U	0.154 U
1,2-Dichloroethane	µg/m^3	0.081 U	0.081 U
1,2-Dichloropropane	µg/m^3	0.092 U	0.092 U
1,3-Butadiene	µg/m^3	0.044 UJ	0.044 UJ
1,3-Dichlorobenzene	µg/m^3	0.12 U	0.12 U
1,4-Dichlorobenzene	µg/m^3	0.12 U	0.12 U
Benzene	µg/m^3	0.224 U	0.224 U
Bromodichloromethane	µg/m^3	0.134 U	0.134 U
Bromoform	µg/m^3	0.207 U	0.207 U
Carbon Tetrachloride	µg/m^3	0.377	0.409
Chlorobenzene	µg/m^3	0.092 U	0.092 U
Chloroform	µg/m^3	0.195	0.098 U
cis-1,2-Dichloroethene	µg/m^3	0.079 U	0.079 U
Ethylbenzene	µg/m^3	0.087 UJ	0.087 UJ
Isopropylbenzene	µg/m^3	2.46 U	2.46 U
Methyl tert-butyl ether	µg/m^3	0.072 UJ	0.072 UJ
Methylene Chloride	µg/m^3	1.74 U	1.74 U
Naphthalene	µg/m^3	0.262 UJ	0.262 UJ
Tetrachloroethene	µg/m^3	127	84.8
Toluene	µg/m^3	0.188 UJ	0.241 J
trans-1,2-Dichloroethene	µg/m^3	0.079 U	0.079 U
trans-1,3-Dichloropropene	µg/m^3	0.091 U	0.091 U
Trichloroethene	µg/m^3	0.107 U	0.107 U
Vinyl Chloride	µg/m^3	0.051 U	0.051 U
Xylenes (total)	µg/m^3	0.261 U	0.36

Notes:

U - Constituent not detected

µg/m^3 - micrograms per cubic meter

J - Indicates an estimated value



LEGEND:

- ⊕ SUB–SLAB AND INDOOR AIR SAMPLING LOCATIONS
- ● OUTDOOR AMBIENT AIR SAMPLING LOCATION
- —x— FENCE
- F FURNACE
- W WASHER
- D DRYER
- H HOT WATER HEATER
- S SEWER

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE.

0 10' 20'

GRAPHIC SCALE

UNIFIRST CORPORATION
WOBURN, MA

INDOOR AIR QUALITY AND VAPOR INTRUSION ASSESSMENT: REPORT OF RESULTS

RESIDENCE SAMPLE LOCATIONS 2011

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FIGURE **1**

Appendix A

Sampling Logs

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Indoor Air Sample Collection Log

		Sample ID:	AA-10M-1-06162011
Client:	UniFirst	Outdoor/Indoor:	Outdoor
Project:	Wells G & H	Sample Intake Height:	3'
Location:	Woburn, MA	Tubing Information:	None
Project #:	MA000909.0002.00003	Miscellaneous Equipment:	None
Samplers:	M Jacksman	Time On/Off:	1702-1715
Sample Point Location:	REDACTED, Back Yard	Subcontractor:	None

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
6/16/2011	1702	-24.8"	86°F	38%	1mph	29.72	
6/17/2011	1632	-10.8"	74°F	66%	2mph	29.81	
	1713	-10.4"					

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L (6 L)
Canister ID:	998
Flow Controller ID:	077
Notes:	

General Observations/Notes:

- Upwind of house, same location as previous sample
- Lawn mowing in back yard at end of sampling

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Indoor Air Sample Collection Log

Client:	UniFirst	Sample ID:	IA-10M-1-06162011
Project:	Wells G&H	Outdoor/Indoor:	indoor
Location:	Woburn, MA	Sample Intake Height:	3'
Project #:	MA000989.0002.00003	Tubing Information:	None
Samplers:	M. Wacksman	Miscellaneous Equipment:	None
Sample Point Location:	REDACTED Basement, near steps to Back Yard	Time On/Off:	1711-1648
		Subcontractor:	None

Dup DA 06162011

Instrument Readings:

sample Dup sample Dup

Date	Time		Canister Vacuum (a) (inches of Hg)		Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
6/16/2011	1711	1711	-29.9"	-30"	76°F	65%	0	29.73	
6/17/2011	1632	1632	-7.26"	-5.62"	78°F	63%	0	29.79	
	1648	1644	-6.95	-4.5"					

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L	(6 L)
Canister ID:	1592	
Flow Controller ID:	168	
Notes:		

Dup = DupIA06162011

Can = 640

FC = 286

General Observations/Notes:

ARCADIS

Indoor Air Sample Collection Log

		Sample ID:	IA-10M-2-06162011
Client:	UniFirst	Outdoor/Indoor:	Indoor
Project:	Wells G & H	Sample Intake Height:	4'
Location:	Woburn, MA	Tubing Information:	None
Project #:	MA000989.0002.00003	Miscellaneous Equipment:	None
Samplers:	M Wacksman	Time On/Off:	1707-1657
Sample Point Location:	Inferior location in Basement	Subcontractor:	None

REDACTED

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
06/16/2011	1707	-30	76°F	65%	0	29.73	
6/17/2011	1632	-9.05"	78°F	63%	0	29.74	
	1657	-8.6"					

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L (6 L)
Canister ID:	959
Flow Controller ID:	240
Notes:	

General Observations/Notes:

ARCADIS

Subslab Soil Vapor Sample Collection Log

		Sample ID:	SS-10m-1-06172011
Client:	On1First	Boring Equipment:	None
Project:	Wells G&H	Sealant:	hydraulic cement
Location:	Woburn, MA	Tubing Information:	Teflon
Project #:	MA000986.0002.00005	Miscellaneous Equipment:	Purge Pump
Samplers:	M. Weickman	Subcontractor:	None
Sample Point Location:	REDACTED Basement, Near stairs to front	Equipment:	—
Sampling Depth:	3 inches below slab	Moisture Content of	Dry
Time and Date of Installation:	3/15/2011	Approximate Purge Volume:	50ml (1 min @ 50ml/min)

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
6/17/2011	1708	-30" Hg					
	1725	-16.5" Hg	74°F	74%	0	24.78	
	1738	-6.0" Hg					

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L (6 L)
Canister ID:	1568
Flow Controller ID:	295
Notes:	

Tracer Test Information (if applicable):

Initial Helium Shroud:	54%
Final Helium Shroud:	56%
Tracer Test Passed:	(Yes) No
Notes:	0ppm in Purge

General Observations/Notes:

Approximating One-Well Volume (for purging):

When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL. Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

ARCADIS

Subslab Soil Vapor Sample Collection Log

		Sample ID:	SS-10M-2-06172011
Client:	Jai First	Boring Equipment:	Drill
Project:	Wells G&H	Sealant:	Clay & Teflon tape
Location:	Woburn, MA	Tubing Information:	Teflon
Project #:	MA000989.0007.00003	Miscellaneous Equipment:	Purge pump
Samplers:	M. Wacksman	Subcontractor:	None
Sample Point Location:	REDACTED Basement	Equipment:	—
Sampling Depth:	3/4" Concrete slab	Moisture Content of	Dry
Time and Date of Installation:	6/17/2011 1720	Approximate Purge Volume:	50ml (1 min @ 50 ml/min)

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
6/17/11	1725	-30"	74°F	74%	0	29.78" Hg	
	1742	-16"					
	1755	-6.7"					

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L (6 L)
Canister ID:	1644
Flow Controller ID:	279
Notes:	

Tracer Test Information (if applicable):

Initial Helium Shroud:	55%
Final Helium Shroud:	62%
Tracer Test Passed:	(Yes) No
Notes:	1000 ppm in Shroud, ok

General Observations/Notes:

Approximating One-Well Volume (for purging):

When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL. Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

ARCADIS

Appendix B

Building Survey and Product Inventory Field Form

THE JOHNSON COMPANY, INC.
100 State Street, Suite 600
Montpelier, Vermont 05602
(802) 229-4600

SOP-JCO-063-002

DRAFT

Indoor Air Quality Building Survey

Sampler: Mitch Wardesman REDACTED Date: June 14, 2011 JCO #: _____

Address: _____

Woburn, MA REDACTED

Contact Name: _____

List of Current Occupants/Occupation:

Age (if under 18)	Sex (m/f)	Occupation
47 yrs	M	Boston Steel - Manufacturing
4 1/2 yrs	M	
13 mo	F	
15 yrs	F	
40 yrs	F	Accountant

Building Construction Characteristics:

What type of building is it? (Circle appropriate responses)

(Single Family) Multi-Family School Commercial Industrial

(Ranch)
Raised Ranch
Cape
Colonial
Split Level
Mobile Home

2-Family
Duplex
Apartment House (# of units ___)
Condominium (# of units ____)
Other (specify) _____

General description of building construction materials: Block wall, stick built

Number of occupied stories: 2 Year built? 1950's

Has the building been weatherized with any of the following? (Circle all that apply)

Insulation Storm windows Energy-efficient windows Other (specify)

Attached garage? (Y/N) Y Vehicle(s) present? (Y/N) Y

Source: MaDEP, 2002, "Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430", Office of Research and Standards, Massachusetts Department of Environmental Protection, April, 2002.

What type of basement does the building have? (Circle all that apply)

(Full basement) Crawlspace Slab-on-grade Other (specify)

What are the characteristics of the basement? (Circle all that apply)

Finished	Basement Floor:	Foundation Walls:	Moisture:
Unfinished	(Concrete)	Poured concrete	Wet
(Partially finished (%)) 70%	Dirt	(Block)	Damp
	Other (specify)	Field stone	(Dry)

Is a basement sump present? (Y/N) Y - clean out only Is sump sealed to indoor air? (Y/N) Y

Does the basement have any of the following characteristics (e.g., preferential vapor pathways) that might permit soil vapor entry? (Circle all that apply)

(Cracks) Pipe/utility conduits Other (specify) - Floor appears to have been paved in sections

Foundation/slab drainage Sump pumps

Heating and Ventilation System(s) Present:

What types of heating system(s) are used in this building? (Circle all that apply)

(Hot air circulation) Heat pump Steam Radiation Wood stove

Other (specify) Air conditioner (central/window) Fireplace (wood/gas)

What types of fuels are used in this building? (Circle all that apply)

Natural gas Electric Coal Other (specify)

(Fuel oil) Wood Solar

What type of mechanical ventilation systems are present and/or currently operating in this building? (Circle all that apply)

Central air conditioning Mechanical fans Bathroom vent fan

(Individual air conditioning) (Kitchen range hood) Air-to-air heat exchanger

Open windows Other (specify)

Sources of Chemical Contaminants:

Source: MaDEP, 2002, "Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430", Office of Research and Standards, Massachusetts Department of Environmental Protection, April, 2002.

Which of these are present in the building?

Potential VOC Source	Location of Source	Major Ingredients	Removed Prior to Air Sampling (Y/N/NA)
Paint or paint thinners			
Gas-powered equipment	Garage		
Gasoline storage cans			
Cleaning solvents			
Air fresheners			
Oven cleaners			
Carpet/ upholstery cleaners			
Hairspray			
Nail polish/ remover	Basement	Isopropyl Alcohol	Yes
Bathroom cleaner			
Appliance cleaner			
Furniture/ floor polish			
Moth balls			
Fuel oil tank			
Wood stove			
Fireplace			
Perfume/ colognes			
Hobby supplies	Basement,	Water Based Paints	NO
Scented potpourri, etc			
Brake cleaner			
Liquid Wrench			
Other	Basement - Bleach,		Yes
Other	detergent, dryer		Yes
Other	sheets		Yes

Do one or more smokers occupy this building on a regular basis? Yes

Has anyone smoked in the building in the last 48 hours? (Y/N) NO - found cigarette butts

Do the occupants frequently have clothes dry-cleaned? (Y/N) NO

Any recent remodeling or repainting (Y/N, describe) NO

Any obvious pressed wood products (e.g. hardwood plywood paneling, particleboard, fiberboard)? (Y/N)

Are there any new upholstery, drapes, carpets, or other textiles? (Y/N) New carpet & Hardwood floors on first floor within one year

Source: MaDEP, 2002, "Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430", Office of Research and Standards, Massachusetts Department of Environmental Protection, April, 2002.

Has the building been treated with any insecticides/pesticides? If so, how often and what chemicals were used? NO

Do any of the occupants apply pesticides/herbicides in the yard or garden? If so, how often and what chemicals are used? NO

Outdoor Sources of Contamination:

Is there any stationary emission source in the vicinity of the building? Un1 First, Highway

Are there any mobile emission sources (e.g., highway; bus stop; high-traffic area) in the vicinity of the building?

Highway 93 & 95 Very Close. Heavy traffic on Olympia and Washington

Weather Conditions During Sampling:

Outside Temperature (°F): 80-85°F

Prevailing wind direction: North

Describe the general weather conditions (e.g., sunny, cloudy, rain):

Sunny and warm

Was there any significant precipitation (0.1 inches) within 12 hours preceding the sampling event? NO

Type of ground cover (e.g., grass, pavement, etc.) outside the building: grass

General Comments

Is there any other information about the structural features of this building, the habits of its occupants or potential sources of chemical contaminants to the indoor air that may be of importance in facilitating the evaluation of the indoor air quality of the building?

Basement Floor Very Thin

Source: MaDEP, 2002, "Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430", Office of Research and Standards, Massachusetts Department of Environmental Protection, April, 2002.

Appendix C

Data Validation Report

Phoenix Chemistry Services

Aug. 8, 2011

Nadine Weinberg
ARCADIS, U.S., Inc.
482 Congress Street, Suite 501
Portland, ME 04101

Reference #s: 2011-0705-001 & -002, and 2011-0715-001 & -002

Dear Nadine,

Phoenix Chemistry Services has submitted four reports on August 4 - 5, 2011 presenting the results of the data validation of Sample Delivery Group (SD) Nos. L1108879, L1108880, L1108884, and L1108885 from the Indoor Air Quality/Vapor Intrusion (IAQ/VI) assessment work at several residential and/or commercial properties in Woburn, MA. The indoor and outdoor air and sub-slab vapor samples in these SDGs were collected June 16 - 18, 2011. The laboratory analyses were performed by Alpha Analytical Laboratories, Inc. of Mansfield, MA.

The data packages and electronic deliverables were received on July 5 and 15, 2011. Two separate data packages for the canister certifications (SDG Nos. L1108049 and L1108435), and associated files L1108879.pdf, L1108880.pdf, L1108884.pdf, L1108885A.pdf, and L1108885B.pdf were received on June 16, 2011. The validation has been performed by Phoenix Chemistry Services according to the Tier III guidelines as defined by USEPA Region I, as presented in "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses", December, 1996. The EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-99/008, October, 1999), the IAQ/VI Quality Assurance Project Plan (QAPP), and the Field-Laboratory Coordination Memorandum (Phoenix Chemistry Services, March 25, 2010) were also considered during the evaluation, and professional judgment was applied as necessary and appropriate. Data qualifiers have been applied in the final validation report as necessary and appropriate, in accordance with these guidelines.

The samples in these four data packages were collected as a single sampling round, and utilized shared quality control (QC) samples, including two trip blanks, four outdoor air samples, four field duplicate pairs, and two laboratory replicates. The trip blanks and laboratory replicates were each logged in and reported in at least two data packages to avoid collecting redundant QC samples, as requested by the field engineer. Only one set of results for these QC samples was retained in the project database to avoid duplications; the earliest laboratory identifier was selected to be validated and reported. The laboratory is maintaining the original reporting packages.

A reporting error was noted in the clean canister certification package SDG No. L1108435; an incorrect copy of the initial calibration was included in the raw data section, and the continuing calibration presented incorrect percent difference values, as the compounds were evaluated against the incorrect initial calibration. The laboratory quickly responded to the validator's request for a copy of the missing initial calibration, however, a revision of the data package with the corrected continuing calibration has not yet been received (the validator performed the checks manually after receiving the correct initial calibration). The laboratory should be reminded that this is still outstanding.

Thank you for this opportunity to provide data validation services to ARCADIS. If there are any questions or concerns about the material in this report, please do not hesitate to contact me for help and clarification.

Sincerely,

Deborah H. Gaynor, Ph.D.
Principal, Phoenix Chemistry Services

Phoenix Chemistry Services | 126 Covered Bridge Road | North Ferrisburg | Vermont | 05473
Telephone: (802) 233-2473 | Website: www.phoenixchemistryservices.com | Email: dgaynor@phoenixchemistryservices.com

DATA VALIDATION

FOR

UniFirst-Woburn Vapor Intrusion Assessment
Woburn, MA

ORGANIC ANALYSIS DATA
Selected Volatiles in Air Samples

Sample Delivery Group (SDG) No.
L1108884

Chemical Analyses Performed by:

Alpha Analytical Laboratories, Inc.
320 Forbes Blvd.
Mansfield, MA 02048

FOR

ARCADIS U.S., Inc.
482 Congress Street, Suite 501
Portland, ME 04101

Data Validation Report by:

Phoenix Chemistry Services
126 Covered Bridge Rd.
N. Ferrisburg, VT 05473
(802) 233-2473
Aug. 5, 2011

Reference #2011-0715-001
VOA Air Validation Report/L1108884/dhg

EXECUTIVE SUMMARY

Phoenix Chemistry Services (Phoenix) has completed the validation of the Method TO-15 Selected Ion Monitoring (SIM) volatiles in air analysis data prepared by Alpha Analytical Laboratories of Mansfield, MA, for 6 air samples and one (1) trip blank (TB) from a residential property in Woburn, MA. The laboratory reported the data under Sample Delivery Group (SDG) No. L1108884, which was submitted as a single data package received by Phoenix on July 15, 2011, and includes the following samples:

Sample ID	Laboratory ID
AA-10M-1-06162011	L1108884-01
IA-10M-2-06162011	L1108884-02
IA-10M-1-06162011	L1108884-03
DUPIA-06162011	L1108884-04
SS-10M-2-06172011	L1108884-05
SS-10M-1-06172011	L1108884-06
TB06182011	L1108884-07

A cross-reference table of sample IDs was provided in the data package. A separate data package, SDG No. L1108049, containing the supporting documentation (clean can certifications) for the preparation and analysis of the sampling canisters, and a file (L1108884.pdf) containing the raw data for the vacuum check upon receipt and the flow controller rate checks, were also submitted on June 16 and July 15, 2011, respectively.

The samples in this data set represent the indoor air and the sub-slab soil vapor samples (matched to the indoor sampling locations) collected from June 16 to 17, 2011 in Woburn, MA inside a residential building, and an ambient air sample collected outdoors at the sample location on June 16, 2011. All samples were kept in the engineer's custody after sampling until hand-delivered by laboratory courier to the laboratory on June 18, 2011.

Findings of the validation effort resulted in the following qualifications of sample results:

- Results for naphthalene and 1,3-butadiene in all samples were qualified as estimated (J, UJ).
- Results for methyl tert-butyl ether (MTBE), toluene, ethylbenzene, and naphthalene in all samples were qualified as estimated (J, UJ).
- Results for methylene chloride in IA-10M-1-06162011 and DUPIA06162011 were qualified as estimated (J).
- The laboratory appropriately applied "J" qualifiers to the CLP-like sample Form 1s when the concentration of an analyte was less than the sample-specific QL for the analytes naphthalene, 1,2-dibromoethane, and bromodichloromethane in the TO-15 SIM analysis. The validator did not remove these qualifiers.

The Overall Evaluation of Data (Section XVI) summarizes the validation results. The validation

findings and conclusions for each analytical parameter are detailed in the remaining sections of this report.

Documentation problems observed in the data package are described in Section XVII.

This validation report shall be considered part of the data package for all future distributions of TO - 15 SIM (volatiles in air) analysis data for SDG No. L1108884.

INTRODUCTION

Analyses of selected volatiles in air samples were performed according to Method TO-15, as modified for Selected Ion Monitoring (SIM) in the laboratory standard operating procedure (SOP) No. A-001, and in accordance with requirements in the Quality Assurance Project Plan (QAPP) for Indoor Air Quality and Vapor Intrusion Assessment, Rev. 2, March, 2010. The target compound list was limited to the compounds listed in Form K of the QAPP, and reporting limits are as specified there.

Tentative identification of non-target analyte peaks (i.e., tentatively identified compounds, or TICs) was not requested for these analyses.

Phoenix's validation was performed in conformance with Tier III guidelines as defined by USEPA Region I. Data qualifiers are applied as necessary and appropriate. To the extent possible, the data were evaluated in accordance with the "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses", December, 1996. EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-94/012, 2/94) and the QAPP were also considered during the evaluation, and professional judgment was applied as necessary and appropriate.

The data validation process evaluates data on a technical basis for chemical analyses conducted under the USEPA Contract Laboratory Program (CLP) or other well-defined methods. Contract compliance is evaluated only in specific situations. Issues pertaining to contractual compliance are noted where applicable. It is assumed that the data package is presented in accordance with the CLP requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate and sufficient quality review prior to submission for validation.

Results of sample analyses are reported by the laboratory as either qualified or unqualified; various qualifier codes are used by the laboratory to denote specific information regarding the analytical results. During the validation process, laboratory data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added, deleted or modified by the data validator. Raw data is examined in detail to check calculations, compound identification, and/or transcription errors. Validated results are either qualified or unqualified; if results are unqualified, this means that the reported values may be used without reservation. Final validated results are annotated with the following codes, as defined in the EPA Region I Functional Guidelines:

U - The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit. The sample quantitation limit accounts for sample specific dilution factors and percent solids corrections or sample sizes that deviate from those required by the method.

J - The associated numerical value is an estimated quantity.

UJ - The analyte was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

R - The data are unusable (analyte may or may not be present). Resampling and reanalysis is necessary for verification. The R replaces the numerical value or sample quantitation limit.

In some instances (e.g., a dilution) a result may be indicated as "rejected" to avoid confusion when a more quantitatively accurate result is available.

EB, TB, BB - An analyte that was identified in an aqueous equipment (field) blank, trip blank, or bottle blank that was used to assess field contamination associated with soil/sediment samples. These qualifiers are to be applied to soil/sediment sample results only.

These codes are assigned during the validation process and are based on the data review of the results. They are recorded in the "Validator_Qualifier" column, and are also found with the validated laboratory-applied qualifiers in the "Qualifier" column in the electronic spreadsheet contained in Attachment A.

All data users should note two facts. First, **the "R" qualifier means that the laboratory-reported value is completely unusable.** The analysis is invalid due to significant quality control problems, and provides no information as to whether the compound is present or not. Rejected values should not appear on data tables because they have no useful purpose under any circumstances. Second, **no analyte concentration is guaranteed to be accurate even if all associated quality control is acceptable.** While strict quality control conformance provides well-defined confidence in the reported results, any analytical result will always contain some error.

The user is also cautioned that the validation effort is based on the materials provided by the laboratory. Software manipulation, resulting in misleading raw data printouts, cannot be routinely detected during validation; unless otherwise stated in the report, these kinds of issues are outside the scope of this review.

Detailed Findings of Measurement Error Associated with the Analytical Analysis

I. Sample Integrity

The outdoor and indoor air samples for volatiles analysis were collected over a 24-hour period from June 16 to 17, 2011, and the matching sub-slab (soil vapor) samples were collected at mid-day on June 17, 2011 for a 30-minute period. The property is located in Woburn, MA. All analyses were performed within eleven (11) days after sample collection, which is within the 30 day holding time defined in Method TO-15.

The canisters were delivered by laboratory courier to the field sampler's possession and after sampling the canisters were hand-delivered by laboratory courier to the laboratory three days after collection ended; the canisters were kept in the field engineer's office during the intervening days. A separate data package, SDG No. L1108049, was also submitted (on June 16, 2011), containing the supporting documentation (clean can certification) for the preparation and pre-sampling cleanliness check analysis of the canisters; the raw data for the vacuum and flow controller checks, as documented in the file L1108884.pdf was submitted on June 16, 2011.

The Chain of Custody (COC) and the Canister and Flow Controller Information records show that the sample canisters were collected and transported according to method specifications.

All canisters submitted to the field for use met all applicable method requirements. Based on acceptable sampling equipment conditions at receipt, sample integrity was deemed acceptable for all samples.

Field log books containing records of height of canister intake, barometric pressure, and ambient temperature at sampling locations were not submitted for review as part of this validation effort.

II. GC/MS Instrument Performance Check (Tuning)

The samples for volatiles in air analyses from SDG No. L1108884 were analyzed on a single GC/MS system identified as instrument Airlab7. The tuning of this instrument was demonstrated with analysis of 4-bromofluorobenzene (BFB); tunes were analyzed for each 24-hour period during which the samples or associated standards were analyzed. All three BFB tunes were correctly calculated, within acceptance limits, and are reported accurately on the Form 5 summaries in the data package.

III. Initial Calibration (IC)

One IC (6/25/11) was performed on instrument Airlab7 in support of the TO-15 SIM sample analyses. The IC was performed at ten concentration levels (0.02, 0.04, 0.1, 0.2, 0.5, 1.0, 2.5, 5.0, 10, and 50 part per billion by volume [ppbv]), except that the 0.02 ppbv standard was not used for calibration of naphthalene. It was noted that a standard at 20 ppbv was also analyzed and included in the data package, but was not used in the instrument calibration. Documentation of all individual IC standards was present in the data package and relative response factor (RRF) as well as percent relative standard deviation (%RSD) values were correctly calculated and accurately reported on the Form 6 summary.

Manual integrations for some target analytes, internal standards, or surrogate standards were performed in some standards and samples in this data set. The before and after ion chromatograms, the reason for the manual integration, and the analyst's initials and date were printed for each manual integration.

All average RRF values were above the 0.05 minimum criterion, and all %RSDs were below the maximum limit (30%) specified by Region I, with the exception that naphthalene exhibited a 37.3 %RSD.

An Independent Calibration Verification (ICV) sample analysis at 20 ppbv was analyzed on 6/27/11. All spiked analytes were recovered within 70 – 130 % recovery of expected values in the ICV analysis, with the exception of 1,3-butadiene, which was recovered at -41.7 % recovery.

Since the reporting limit for naphthalene is set above the lowest standard used in the calibration, no actions are necessary on the basis of the modification of the initial calibration range for this compound. On the basis of the unacceptably high %RSD value in the associated IC, results for naphthalene in all samples were qualified as estimated (J, UJ). On the basis of the unacceptably low recovery in the associated ICV analysis, results for 1,3-butadiene in all samples were qualified as estimated (J, UJ).

IV. Continuing Calibration (CC)

One continuing calibration (CC) standard performed on 6/29/11 was reported in support of the TO-15 SIM sample analyses reported in this data package; this analysis is also reported as the laboratory control sample analysis for this analytical window. Since this is an independent standard, this is acceptable, although redundant. Sample results were properly reported using the average RRF of the calibration curve for quantitation. Documentation of the standard analysis was present, and RRF as well as percent difference (%D) values were reported on the Form 7 summary within the data package. All RRF values were above the 0.05 minimum criterion, and all %D values were below the maximum limit (25%) specified by Region 1, with the following exceptions:

Table 1. Continuing Calibration (CC) Standard Exceedances

CC Date & Time	Analyte	%D	Associated Samples
6/29/11 14:07	methyl tert-butyl ether (MTBE)	+26.9	all samples
	toluene	+27.1	
	ethylbenzene	+25.8	
	naphthalene	-27.2	

It should be noted that a positive % D value (the CC response factor is less than the IC response factor) will result in a low bias for positive detects, and a negative % D will result in a high bias for positive detects.

On the basis of the unacceptably high %D values in the associated CC standard, results for methyl tert-butyl ether (MTBE), toluene, ethylbenzene, and naphthalene in all samples were qualified as estimated (J, UJ).

V. Blanks

Results for one air-matrix laboratory method blank (MB) were reported in association with the TO-15 SIM sample analyses. No target compounds were found in the MB.

One trip blank (TB), which was used as a field blank, was reported in this data package. The date of collection for the TB was set as 6/18/11, since it was used for sample canisters collected between 6/16/11 and 6/18/11 at two locations submitted to the lab at the same time. No target compounds were found in the TB.

Neither a trip blank nor a field blank is required for Method TO-15.

VI. Surrogate Compounds

No surrogate compounds are used in these methods.

VII. Internal Standards (IS)

All IS areas and retention times (RT) were within the established QC limits for all reported sample analyses in this data package.

VIII. Laboratory Duplicates

A matrix spike/matrix spike duplicate (MS/MSD) analysis is not used in this method. A laboratory duplicate analysis of a field sample (matrix duplicate) analysis is also not required but was performed per laboratory protocols. Sample SS-10M-1-06172011 was reported for laboratory duplicate analysis (WG476109-5). Relative percent difference (RPD) values were reported on a Form 3 summary within the data package.

Precision in the laboratory duplicate analyses (5.5 %RPD) was acceptable (less than 30 % RPD, for the single analyte greater than five times the reporting limit, on the basis of professional judgment).

IX. Field Duplicates

One field duplicate pair was collected in this sample set. Sample IA-10M-1-06162011 was identified as the field duplicate of DUPIA06162011.

Relative percent difference (RPD) values for compounds detected at greater than five times the quantitation limit in at least one member of a field duplicate pair must be less than 25 %RPD as per the QAPP. Precision in the field duplicate pair(range, 0 – 5.2 %RPD) was acceptable (less than 30 %RPD for all analytes greater than five times the reporting limit, on the basis of professional judgment), with the exception of methylene chloride (153 %RPD).

On the basis of unacceptable precision in the field duplicate pair, results for methylene chloride in IA-10M-1-06162011 and DUPIA06162011 were qualified as estimated (J).

X. Sensitivity Check

An MDL study for the TO-15 SIM method was analyzed by the laboratory on May 7, 2009, and the most recent verification study was performed between February 3 and 4, 2010. All target analytes in the statistical study had calculated MDLs below the method quantitation limits (QLs), and demonstrated acceptable ratios (at least 3:1) of the QL to the MDL. The QLs are also supported by the low concentration standard (at 0.020 ppbv) in the initial calibration.

Project objectives required a low reporting limit (RL) for naphthalene, and in order to achieve project objectives for detection limits, the analytes 1,2-dibromoethane (EDB), bromodichloromethane, and naphthalene were evaluated by the laboratory down to one-half the RL; concentrations between one-half the RL and the RL were reported with a "J" qualifier to indicate that this was an estimated concentration on the Form 1 summaries; results below the QL were only detected for naphthalene in this sample set.

On the basis of acceptable sensitivity and accuracy, as demonstrated by the MDL study and supported by the initial calibration, all results for the TO-15 SIM method (detects and non-detects) not qualified for other reasons are deemed acceptable as reported.

XI. Performance Evaluation Samples (PES)/Accuracy Check

One zero blind PE samples (commonly known as a laboratory control sample, LCS) was prepared and analyzed by the laboratory in support of the TO-15 SIM sample analyses; this analysis was also reported as the CC standard analysis for this data set. All target analytes were spiked into the QC sample at 20 ppbv. Percent recoveries (%R) were correctly calculated for the spiked compounds, accurately reported on the Form 3 summary in the data package, and were within the laboratory established QC limits (70 - 130 %R) for all target analytes. No spiked duplicate analyses were performed for either method, so laboratory precision was not evaluated using spiked analyses.

No external single-blind PES sample for either method was required or submitted with the samples in this data set.

Since all samples in this data set were previously qualiifed for the unacceptably low recovery of 1,3 – butadiene in this analysis (as an ICV), no further qualifications were applied.

XII. Target Compound Identification

Reported target compounds were correctly identified for all samples in this data set.

XIII. Compound Quantitation and Reported Quantitation Limits

Target compound quantitation and practical quantitation limits (PQLs) were accurately reported on the Form 1 summaries. Results below the RL are not reported by the laboratory for this method. However, at the client's request, positive results for naphthalene, bromodichloromethane, and 1,2-dibromoethane (EDB) were evaluated down to one-half the RL, and reported with a "J" qualifier by the laboratory on the Form 1s.

One compound was reported with reporting limits slightly higher than specified in the QAPP. Total xylenes were reported with a quantitation limit of 0.261 ug/m^3. No qualifications were deemed necessary on the basis of the RL slightly above that specified in the QAPP for total xylenes, since this concentration is still well below the risk screening level.

The laboratory appropriately applied "J" qualifiers to the CLP-like sample Form 1s when the concentration of an analyte was less than the sample-specific QL for the analytes naphthalene, 1,2-dibromoethane, and bromodichloromethane in the TO-15 SIM analysis. The validator did not remove these qualifiers (results below the QL were only detected for naphthalene in this sample set).

The values that the validator has judged to be acceptable are presented on the electronic deliverable generated from the project database (Attachment A). Qualifiers applied by the validator during the validation effort have been listed on the electronic spreadsheet in an additional column labeled "Validator_Qualifier". The column labeled "Qualifier" contains both qualifiers applied by the laboratory and those applied by the validator; all qualifiers in this column have been accepted or changed during the validation effort. The column labeled "PreValidationFlag", which is generated by the database utility, also indicates which qualifiers were changed by the validator. Sample-specific quantitation limits may be found on the Form 1 for each sample or in the electronic deliverable (Attachment A, column "ReportingLimit").

The Form 1s submitted in the data package present results in units of ug/m^3 as well as in ppbv. Results are also presented almost entirely in units of ug/m^3 in the electronic data deliverable (EDD). Both the forms and the EDD were examined during the data validation process.

All positive results are listed on the electronic data deliverable, whether or not the value or qualifier was changed as a result of the validation. All non-detected results are listed on the electronic data deliverable with a Qualifier of "U" or "UJ"; these are also found as less-than (<) values in the "TextResult" column. If the reported result value was changed during the validation effort from a positive result to a value representing a concentration not detected at or below, the value representing the new reporting limit is reported as the Result with a Validator Qualifier of "U" or "UJ" and a "<" sign in the "TextResult" column.

XIV. Tentatively Identified Compounds (TICs)

Evaluation of unidentified, non-target analyte peaks was not requested or performed for these samples.

XV. System Performance

The analytical system appears to have been working acceptably, based on instrument printouts and spectral quality.

XVI. Overall Evaluation of Data

Findings of the validation effort resulted in the following qualifications:

- On the basis of the unacceptably high %RSD value in the associated IC, results for naphthalene in all samples were qualified as estimated (J, UJ).

- On the basis of the unacceptably low recovery in the associated ICV analysis, results for 1,3-butadiene in all samples were qualified as estimated (UJ).

- On the basis of the unacceptably high %D values in the associated CC standard, results for methyl tert-butyl ether (MTBE), toluene, ethylbenzene, and naphthalene in all samples were qualified as estimated (J, UJ).

- On the basis of unacceptable precision in the field duplicate pair, results for methylene chloride in IA-10M-1-06162011 and DUPIA06162011 were qualified as estimated (J).

- The laboratory appropriately applied "J" qualifiers to the CLP-like sample Form 1s when the concentration of an analyte was less than the sample-specific QL for the analytes naphthalene, 1,2-dibromoethane, and bromodichloromethane in the TO-15 SIM analysis. The validator did not remove these qualifiers.

XVII. Documentation

The required records for canister cleanliness were submitted as a separate data package, SDG No. L1108049, and all required records were properly included with this data package. Canister cleanliness and auxiliary equipment status was acceptable upon release from the laboratory, and appropriate checks and actions were performed as required upon sample and equipment receipt.

The chain of custody (COC) records were present and accurately completed for all reported samples.

Data presentation was acceptable, with the following observation:

- One compound was reported with reporting limits slightly higher than specified in the QAPP. Total xylenes were reported with a quantitation limit of 0.261 ug/m^3.

This validation report should be considered part of the data package for all future distributions of the TO-15 SIM (volatiles in air) analysis data for SDG No. L1108884.

ATTACHMENT A

ELECTRONIC DELIVERABLE (EDD)
SDG No. L1108884
Selected Volatiles in Air Samples
(submitted electronically)

Appendix D

Laboratory Analytical Data Package

ANALYTICAL REPORT

Lab Number:	L1108884
Client:	Arcadis 482 Congress Street Suite 501 Portland, ME 04101
ATTN:	Nadine Weinberg
Phone:	(207) 828-0046
Project Name:	UNIFIRST WELLS G&H
Project Number:	MA000989.0002.00003
Report Date:	07/05/11

Certifications & Approvals: MA (M-MA030), NY (11627), CT (PH-0141), NH (2206), NJ (MA015), RI (LAO00299), ME (MA0030), PA (Registration #68-02089), LA NELAC (03090), FL NELAC (E87814), US Army Corps of Engineers.

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003

Lab Number: L1108884
Report Date: 07/05/11

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1108884-01	AA-10M-1-06162011	WOBURN, MA	06/17/11 17:13
L1108884-02	IA-10M-2-06162011	WOBURN, MA	06/17/11 16:57
L1108884-03	IA-10M-1-06162011	WOBURN, MA	06/17/11 16:48
L1108884-04	DUPIA-06162011	WOBURN, MA	06/17/11 00:00
L1108884-05	SS-10M-1-06172011	WOBURN, MA	06/17/11 17:38
L1108884-06	SS-10M-2-06172011	WOBURN, MA	06/17/11 17:55
L1108884-07	TB06182011	WOBURN, MA	06/18/11 00:00

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003

Lab Number: L1108884
Report Date: 07/05/11

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

For additional information, please contact Client Services at 800-624-9220.

The canister certification results are provided as an addendum.

L1108884-01 The RPD of the pre- and post-flow controller calibration check (24% RPD) was outside acceptable limits (< or = 20% RPD).

Volatile Organics in Air (SIM)
1,2-Dibromoethane, Bromodichloromethane and Naphthalene were evaluated to 1/2 the RL and are J qualified if the concentration is below the quantitation limit (RDL), but greater than or equal to 1/2 the RDL.
Values are estimated.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kathleen M. O'Brien Kathleen O'Brien

Title: Technical Director/Representative Date: 07/05/11

AIR

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-01
Client ID: AA-10M-1-06162011
Sample Location: WOBURN, MA
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 17:16
Analyst: RY

Date Collected: 06/17/11 17:13
Date Received: 06/20/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.055	0.020	0.020	0.270	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	0.099	0.070	0.070	0.316	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	0.072	0.020	0.020	0.453	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.028	0.020	0.020	0.137	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	0.046	0.020	0.020	0.200	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	0.027	0.050	0.025	0.142	0.262	0.131	J	1
Xylenes, Total	0.209	0.060	0.060	0.908	0.261	0.261		1
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	0.323	0.050	0.050	1.22	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-01
Client ID: AA-10M-1-06162011
Sample Location: WOBURN, MA
Date Collected: 06/17/11 17:13
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	113		60-140
bromochloromethane	103		60-140
chlorobenzene-d5	106		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-02
Client ID: IA-10M-2-06162011
Sample Location: WOBURN, MA
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 17:50
Analyst: RY

Date Collected: 06/17/11 16:57
Date Received: 06/20/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.256	0.020	0.020	1.26	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	0.032	0.020	0.020	0.130	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	0.068	0.020	0.020	0.150	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	0.228	0.070	0.070	0.728	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	0.073	0.020	0.020	0.459	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.101	0.020	0.020	0.493	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	0.169	0.020	0.020	0.734	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	0.276	0.050	0.025	1.45	0.262	0.131		1
Xylenes, Total	0.713	0.060	0.060	3.10	0.261	0.261		1
Tetrachloroethene	0.109	0.020	0.020	0.739	0.136	0.136		1
Toluene	1.12	0.050	0.050	4.22	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-02
Client ID: IA-10M-2-06162011
Sample Location: WOBURN, MA
Date Collected: 06/17/11 16:57
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	115		60-140
bromochloromethane	101		60-140
chlorobenzene-d5	117		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-03
Client ID: IA-10M-1-06162011
Sample Location: WOBURN, MA
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 18:25
Analyst: RY

Date Collected: 06/17/11 16:48
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.302	0.020	0.020	1.48	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	0.034	0.020	0.020	0.138	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	0.048	0.020	0.020	0.106	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	0.028	0.020	0.020	0.168	0.120	0.120		1
Benzene	0.229	0.070	0.070	0.732	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	0.071	0.020	0.020	0.447	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.121	0.020	0.020	0.591	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	0.170	0.020	0.020	0.738	0.087	0.087		1
Methylene chloride	6.08	0.500	0.500	21.1	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	0.343	0.050	0.025	1.80	0.262	0.131		1
Xylenes, Total	0.711	0.060	0.060	3.09	0.261	0.261		1
Tetrachloroethene	0.110	0.020	0.020	0.746	0.136	0.136		1
Toluene	1.40	0.050	0.050	5.28	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-03
Client ID: IA-10M-1-06162011
Sample Location: WOBURN, MA
Date Collected: 06/17/11 16:48
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	130		60-140
bromochloromethane	101		60-140
chlorobenzene-d5	114		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-04
Client ID: DUPIA-06162011
Sample Location: WOBURN, MA
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 18:59
Analyst: RY

Date Collected: 06/17/11 00:00
Date Received: 06/20/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.318	0.020	0.020	1.56	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	0.034	0.020	0.020	0.138	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	0.049	0.020	0.020	0.108	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	0.240	0.070	0.070	0.767	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	0.075	0.020	0.020	0.472	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.117	0.020	0.020	0.571	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	0.172	0.020	0.020	0.747	0.087	0.087		1
Methylene chloride	0.800	0.500	0.500	2.78	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	0.343	0.050	0.025	1.80	0.262	0.131		1
Xylenes, Total	0.749	0.060	0.060	3.25	0.261	0.261		1
Tetrachloroethene	0.124	0.020	0.020	0.841	0.136	0.136		1
Toluene	1.47	0.050	0.050	5.54	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-04
Client ID: DUPIA-06162011
Sample Location: WOBURN, MA
Date Collected: 06/17/11 00:00
Date Received: 06/20/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	0.026	0.020	0.020	0.140	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	121		60-140
bromochloromethane	104		60-140
chlorobenzene-d5	104		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-05
Client ID: SS-10M-1-06172011
Sample Location: WOBURN, MA
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 22:59
Analyst: RY

Date Collected: 06/17/11 17:38
Date Received: 06/20/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	0.028	0.020	0.020	0.153	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.024	0.020	0.020	0.118	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	0.060	0.020	0.020	0.377	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.040	0.020	0.020	0.195	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
Xylenes, Total	ND	0.060	0.060	ND	0.261	0.261		1
Tetrachloroethene	18.7	0.020	0.020	127	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-05
Client ID: SS-10M-1-06172011
Sample Location: WOBURN, MA
Date Collected: 06/17/11 17:38
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	133		60-140
bromochloromethane	115		60-140
chlorobenzene-d5	113		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-06
Client ID: SS-10M-2-06172011
Sample Location: WOBURN, MA
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/30/11 00:08
Analyst: RY

Date Collected: 06/17/11 17:55
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	0.027	0.020	0.020	0.147	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.039	0.020	0.020	0.192	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	0.065	0.020	0.020	0.409	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
Xylenes, Total	0.083	0.060	0.060	0.360	0.261	0.261		1
Tetrachloroethene	12.5	0.020	0.020	84.8	0.136	0.136		1
Toluene	0.064	0.050	0.050	0.241	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-06
Client ID: SS-10M-2-06172011
Sample Location: WOBURN, MA
Date Collected: 06/17/11 17:55
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	115		60-140
bromochloromethane	104		60-140
chlorobenzene-d5	105		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-07
Client ID: TB06182011
Sample Location: WOBURN, MA
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 16:41
Analyst: RY

Date Collected: 06/18/11 00:00
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
Xylenes, Total	ND	0.060	0.060	ND	0.261	0.261		1
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

SAMPLE RESULTS

Lab ID: L1108884-07
Client ID: TB06182011
Sample Location: WOBURN, MA
Date Collected: 06/18/11 00:00
Date Received: 06/20/11
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	117		60-140
bromochloromethane	100		60-140
chlorobenzene-d5	100		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 15:31

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab for sample(s): 01-07 Batch: WG476109-4								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
Xylenes, Total	ND	0.060	0.060	ND	0.261	0.261		1
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003
Lab Number: L1108884
Report Date: 07/05/11

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15-SIM
Analytical Date: 06/29/11 15:31

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab for sample(s): 01-07 Batch: WG476109-4								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Lab Control Sample Analysis

Batch Quality Control

Project Name: UNIFIRST WELLS G&H

Project Number: MA000989.0002.00003

Lab Number: L1108884

Report Date: 07/05/11

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-07 Batch: WG476109-3								
1,1,1-Trichloroethane	104		-		70-130	-		25
1,1,2-Trichloroethane	88		-		70-130	-		25
1,1-Dichloroethane	89		-		70-130	-		25
1,1-Dichloroethene	91		-		70-130	-		25
1,2,4-Trimethylbenzene	92		-		70-130	-		25
1,2-Dibromoethane	90		-		70-130	-		25
1,2-Dichloroethane	82		-		70-130	-		25
1,2-Dichloropropane	88		-		70-130	-		25
1,3-Butadiene	89		-		70-130	-		25
1,3-Dichlorobenzene	95		-		70-130	-		25
1,4-Dichlorobenzene	94		-		70-130	-		25
Benzene	78		-		70-130	-		25
Bromodichloromethane	102		-		70-130	-		25
Bromoform	96		-		70-130	-		25
Carbon tetrachloride	108		-		70-130	-		25
Chlorobenzene	83		-		70-130	-		25
Chloroform	91		-		70-130	-		25
cis-1,2-Dichloroethene	86		-		70-130	-		25
Ethylbenzene	74		-		70-130	-		25
Methylene chloride	82		-		70-130	-		25
Methyl tert butyl ether	73		-		70-130	-		25

Lab Control Sample Analysis

Batch Quality Control

Project Name: UNIFIRST WELLS G&H

Project Number: MA000989.0002.00003

Lab Number: L1108884

Report Date: 07/05/11

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-07 Batch: WG476109-3								
Naphthalene	127		-		70-130	-		25
p/m-Xylene	76		-		70-130	-		25
o-Xylene	88		-		70-130	-		25
Tetrachloroethene	92		-		70-130	-		25
Toluene	73		-		70-130	-		25
trans-1,2-Dichloroethene	83		-		70-130	-		25
trans-1,3-Dichloropropene	76		-		70-130	-		25
Trichloroethene	101		-		70-130	-		25
Vinyl chloride	89		-		70-130	-		25
Isopropylbenzene	95		-		70-130	-		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.000

Lab Number: L1108884
Report Date: 07/05/11

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-07 QC Batch ID: WG476109-5 QC Sample: L1108884-05 Client ID: SS-10M-1-06172011						
1,1,1-Trichloroethane	0.028	0.029	ppbV	4		25
1,1,2-Trichloroethane	ND	ND	ppbV	NC		25
1,1-Dichloroethane	ND	ND	ppbV	NC		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
1,2,4-Trimethylbenzene	0.024	0.021	ppbV	13		25
1,2-Dibromoethane	ND	ND	ppbV	NC		25
1,2-Dichloroethane	ND	ND	ppbV	NC		25
1,2-Dichloropropane	ND	ND	ppbV	NC		25
1,3-Butadiene	ND	ND	ppbV	NC		25
1,3-Dichlorobenzene	ND	ND	ppbV	NC		25
1,4-Dichlorobenzene	ND	ND	ppbV	NC		25
Benzene	ND	ND	ppbV	NC		25
Bromodichloromethane	ND	ND	ppbV	NC		25
Bromoform	ND	ND	ppbV	NC		25
Carbon tetrachloride	0.060	0.060	ppbV	0		25
Chlorobenzene	ND	ND	ppbV	NC		25
Chloroform	0.040	0.039	ppbV	3		25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC		25
Ethylbenzene	ND	ND	ppbV	NC		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00(

Lab Number: L1108884
Report Date: 07/05/11

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-07 QC Batch ID: WG476109-5 QC Sample: L1108884-05 Client ID: SS-10M-1-06172011					
Methylene chloride	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
Naphthalene	ND	ND	ppbV	NC	25
Xylenes, Total	ND	ND	ppbV	NC	25
Tetrachloroethene	18.7	17.7	ppbV	5	25
Toluene	ND	ND	ppbV	NC	25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC	25
trans-1,3-Dichloropropene	ND	ND	ppbV	NC	25
Trichloroethene	ND	ND	ppbV	NC	25
Vinyl chloride	ND	ND	ppbV	NC	25
Isopropylbenzene	ND	ND	ppbV	NC	25

Project Name: UNIFIRST WELLS G&H **Lab Number:** L1108884

Project Number: MA000989.0002.00003 **Report Date:** 07/05/11

Canister and Flow Controller Information

Samplenum	Client ID	Media ID	Media Type	Cleaning Batch ID	Initial Pressure (in. Hg)	Pressure on Receipt (in. Hg)	Flow Out mL/min	Flow In mL/min	% RSD
L1108884-01	AA-10M-1-06162011	0077	#30 AMB		-	-	3.3	2.6	24
L1108884-01	AA-10M-1-06162011	998	6.0L Can	L1108049-12	-29.4	-9.9	-	-	-
L1108884-02	IA-10M-2-06162011	0248	#16 AMB		-	-	3.0	3.2	6
L1108884-02	IA-10M-2-06162011	959	6.0L Can	L1108049-01	-29.4	-7.3	-	-	-
L1108884-03	IA-10M-1-06162011	0168	#16 AMB		-	-	3.3	3.3	0
L1108884-03	IA-10M-1-06162011	1592	6.0L Can	L1108049-02	-29.4	-5.9	-	-	-
L1108884-04	DUPIA-06162011	0286	#16 AMB		-	-	3.3	3.4	3
L1108884-04	DUPIA-06162011	640	6.0L Can	L1108049-07	-29.4	-3.6	-	-	-
L1108884-05	SS-10M-1-06172011	0295	#90 SV		-	-	160	166	4
L1108884-05	SS-10M-1-06172011	1568	6.0L Can	L1108049-31	-29.4	-5.0	-	-	-
L1108884-06	SS-10M-2-06172011	0279	#90 AMB		-	-	160	159	1
L1108884-06	SS-10M-2-06172011	1644	6.0L Can	L1108049-29	-29.4	-5.9	-	-	-
L1108884-07	TB06182011	0373	#16 AMB		-	-	6.4	6.8	6
L1108884-07	TB06182011	1711	6.0L Can	L1108049-15	-29.4	-29.4	-	-	-

Air Volatiles Can Certification

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-01
Client ID: CAN 959 FC 248
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/08/11 19:33
Analyst: RY

Date Collected: 06/08/11 00:00
Date Received: 06/08/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.261	0.261		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-01 Date Collected: 06/08/11 00:00

Client ID: CAN 959 FC 248 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-01 Date Collected: 06/08/11 00:00

Client ID: CAN 959 FC 248 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	98		60-140
bromochloromethane	129		60-140
chlorobenzene-d5	82		60-140

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-02
Client ID: CAN 1592 FC 168
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/08/11 20:10
Analyst: RY

Date Collected: 06/08/11 00:00
Date Received: 06/08/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.261	0.261		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-02 Date Collected: 06/08/11 00:00

Client ID: CAN 1592 FC 168 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-02 Date Collected: 06/08/11 00:00

Client ID: CAN 1592 FC 168 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	85		60-140
bromochloromethane	117		60-140
chlorobenzene-d5	81		60-140

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-07
Client ID: CAN 640 FC 286
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/08/11 23:12
Analyst: RY

Date Collected: 06/08/11 00:00
Date Received: 06/08/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.261	0.261		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-07 Date Collected: 06/08/11 00:00

Client ID: CAN 640 FC 286 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-07 Date Collected: 06/08/11 00:00

Client ID: CAN 640 FC 286 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	79		60-140
bromochloromethane	107		60-140
chlorobenzene-d5	70		60-140

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-12
Client ID: CAN 998 FC 077
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/09/11 02:14
Analyst: RY

Date Collected: 06/08/11 00:00
Date Received: 06/08/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.261	0.261		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-12 Date Collected: 06/08/11 00:00

Client ID: CAN 998 FC 077 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-12 Date Collected: 06/08/11 00:00

Client ID: CAN 998 FC 077 Date Received: 06/08/11

Sample Location: Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	92		60-140
bromochloromethane	118		60-140
chlorobenzene-d5	79		60-140

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-15
Client ID: CAN 1711 FC 373
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/09/11 22:01
Analyst: RY

Date Collected: 06/09/11 00:00
Date Received: 06/09/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.261	0.261		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-15 Date Collected: 06/09/11 00:00

Client ID: CAN 1711 FC 373 Date Received: 06/09/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-15 Date Collected: 06/09/11 00:00

Client ID: CAN 1711 FC 373 Date Received: 06/09/11

Sample Location: Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	95		60-140
bromochloromethane	129		60-140
chlorobenzene-d5	81		60-140

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-29
Client ID: CAN 1644 FC 279
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/11/11 14:27
Analyst: RY

Date Collected: 06/09/11 00:00
Date Received: 06/09/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.261	0.261		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-29 Date Collected: 06/09/11 00:00

Client ID: CAN 1644 FC 279 Date Received: 06/09/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-29 Date Collected: 06/09/11 00:00

Client ID: CAN 1644 FC 279 Date Received: 06/09/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	97		60-140
bromochloromethane	123		60-140
chlorobenzene-d5	77		60-140

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-31
Client ID: CAN 1568 FC 295
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/11/11 15:38
Analyst: RY

Date Collected: 06/09/11 00:00
Date Received: 06/09/11
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.224	0.224		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.207	0.207		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.261	0.261		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-31 Date Collected: 06/09/11 00:00

Client ID: CAN 1568 FC 295 Date Received: 06/09/11

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H ***Lab Number:*** L1108049

Project Number: Not Specified ***Report Date:*** 07/05/11

Air Canister Certification Results

Lab ID: L1108049-31 Date Collected: 06/09/11 00:00

Client ID: CAN 1568 FC 295 Date Received: 06/09/11

Sample Location: Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	94		60-140
bromochloromethane	121		60-140
chlorobenzene-d5	76		60-140

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00003

Lab Number: L1108884
Report Date: 07/05/11

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information **Custody Seal**
Cooler
N/A Present/Intact

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1108884-01A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1108884-02A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1108884-03A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1108884-04A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1108884-05A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1108884-06A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1108884-07A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)

*Values in parentheses indicate holding time in days

Project Name:	UNIFIRST WELLS G&H	**Lab Number:**	L1108884
Project Number:	MA000989.0002.00003	**Report Date:**	07/05/11

GLOSSARY

Acronyms

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than five times (5x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank.

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The RPD between the results for the two columns exceeds the method-specified criteria; however, the lower value has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less

Report Format: DU Report with "J" Qualifiers

Project Name:	UNIFIRST WELLS G&H	**Lab Number:**	L1108884
Project Number:	MA000989.0002.00003	**Report Date:**	07/05/11

Data Qualifiers

than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL). This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample.

Report Format: DU Report with "J" Qualifiers

REFERENCES

48 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b, January 1999.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certificate/Approval Program Summary

Last revised March 23, 2011 – Mansfield Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0141.

Wastewater/Non-Potable Water (Inorganic Parameters: pH, Turbidity, Conductivity, Alkalinity, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Vanadium, Zinc, Total Residue (Solids), Total Suspended Solids (non-filterable), Total Cyanide. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Acid Extractables, Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, PAHs, Haloethers, Chlorinated Hydrocarbons, Volatile Organics.)

Solid Waste/Soil (Inorganic Parameters: pH, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, Zinc, Total Organic Carbon, Total Cyanide, Corrosivity, TCLP 1311. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Volatile Organics, Acid Extractables, Benzidines, Phthalates, Nitrosamines, Nitroaromatics & Cyclic Ketones, PAHs, Haloethers, Chlorinated Hydrocarbons.)

Florida Department of Health Certificate/Lab ID: E87814. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SM2320B, SM2540D, SM2540G.)

Solid & Chemical Materials (Inorganic Parameters: 6020, 7470, 7471, 9045. Organic Parameters: EPA 8260, 8270, 8082, 8081.)

Air & Emissions (EPA TO-15.)

Louisiana Department of Environmental Quality Certificate/Lab ID: 03090. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: EPA 180.1, 245.7, 1631E, 3020, 6020A, 7470A, 9040, 9050A, SM2320B, 2540D, 2540G, 4500H-B, Organic Parameters: EPA 3510C, 3580A, 3630C, 3640A, 3660B, 3665A, 5030B, 8015D, 3570, 8081B, 8082A, 8260B, 8270C.)

Solid & Chemical Materials (Inorganic Parameters: EPA 1311, 3050, 3051A, 3060A, 6020A, 7196A, 7470A, 7471B, 7474, 9040B, 9045C, 9060. Organic Parameters: EPA 3540C, 3570B, 3580A, 3630C, 3640A, 3660, 3665A, 5035, 8015D, 8081B, 8082A, 8260B, 8270C.)

Biological Tissue (Inorganic Parameters: EPA 6020A. Organic Parameters: EPA 3570, 3510C, 3610B, 3630C, 3640A, 8270C.)

Air & Emissions (EPA TO-15.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 2206. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: EPA, 245.1, 245.7, 1631E, 180.1, 6020A, 7470A, 9040B, 9050A, SM2540D, 2540G, 4500H+B, 2320B. Organic Parameters: EPA 8081, 8082, 8260B, 8270C.)

Solid & Chemical Materials (Inorganic Parameters: SW-846 1311, 1312, 3050B, 3051A, 3060A, 6020A, 7470A, 7471A, 9040B, 9045C, 7196A. Organic Parameters: SW-846 3540C, 3580, 3630C, 3640A, 3660B, 3665A, 5035, 8260B, 8270C, 8015D, 8082, 8081A.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA015. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SW-846 1312, 3010, 3020A, 3015, SM2320B, EPA 200.8, SM2540D, 2540G, EPA 120.1, SM2510B, EPA 180.1, 245.1, 1631E, SW-846 7470A, 9040B, 6020, 9010B, 9014 Organic Parameters: SW-846 3510C, 3580A, 5030B, 5035L, 5035H, 3630C, 3640C, 3660B, 3665A, 8015B 8081A, 8082, 8260B, 8270C)

Solid & Chemical Materials (Inorganic Parameters: SW-846 6020, 9010B, 9014, 1311, 1312, 3050B, 3051, 3060A, 7196A, 7470A, 7471A, 9040B, 9045C, 9060. Organic Parameters: SW-846 3540C, 3570, 3580A, 5030B, 5035L, 5035H, 3630C, 3640A, 3660B, 3665A, 8081A, 8082, 8260B, 8270C, 8015B.)

Atmospheric Organic Parameters (EPA TO-15)

Biological Tissue (Inorganic Parameters: SW-846 6020 Organic Parameters: SW-846 8270C, 3510C, 3570, 3630C, 3640A)

New York Department of Health Certificate/Lab ID: 11627. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SM2320B, SM2540D, EPA 200.8, 6020, 1631E, 245.1, 9014, 9040B, 120.1, SM2510B, 4500CN-E, 4500H-B, EPA 376.2, 180.1, 9010B. Organic Parameters: EPA 8260B, 8270C, 8081A, 8082, 3510C, 5030B.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 6020, 7196A, 3060A, 7471A, 7474, 9014, 9040B, 9045C, 9010B. Organic Parameters: EPA 8260B, 8270C, 8081A, DRO 8015B, 8082, 1311, 1312, 3050B, 3580, 3570, 3051, 5035, 5030B.)

Air & Emissions (EPA TO-15.)

Rhode Island Department of Health Certificate/Lab ID: LAO00299. ***NELAP Accredited via LA-DEQ.***

Refer to LA-DEQ Certificate for Non-Potable Water.

Texas Commission of Environmental Quality Certificate/Lab ID: T104704419-08-TX. ***NELAP Accredited.***

Solid & Chemical Materials (Inorganic Parameters: EPA 6020, 7470, 7471, 1311, 7196, 9014, 9040, 9045, 9060. Organic Parameters: EPA 8015, 8270, 8260, 8081, 8082.)

Air (Organic Parameters: EPA TO-15)

Washington State Department of Ecology Certificate/Lab ID: C954. *Non-Potable Water* (Inorganic Parameters: SM2540D, 2510B, EPA 120.1, 180.1, 1631E, 245.7.)

Solid & Chemical Materials (Inorganic Parameters: EPA 9040, 9060, 6020, 7470, 7471, 7474. Organic Parameters: EPA 8081, 8082, 8015 Mod, 8270, 8260.)

U.S. Army Corps of Engineers

Department of Defense Certificate/Lab ID: L2217.01.

Non-Potable Water (Inorganic Parameters: EPA 6020A, SM4500H-B. Organic Parameters: 3020A, 3510C, 5030B, 8260B, 8270C, 8270C-ALK-PAH, 8082, 8081A, 8015D-SHC.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 1312, 3050B, 6020A, 7471A, 9045C, 9060, SM 2540G, ASTM D422-63. Organic Parameters: EPA 3580A, 3570, 3540C, 5035A, 8260B, 8270C, 8270-ALK-PAH, 8082, 8081A, 8015D-SHC, 8015-DRO.

Air & Emissions (EPA TO-15.)

Analytes Not Accredited by NELAP

Certification is not available by NELAP for the following analytes: **8270C:** Biphenyl. **TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 2-Methylnaphthalene, 1-Methylnaphthalene.

CHAIN OF CUSTODY

ALPHA ANALYTICAL
320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

L1108884

Serial No:07051113:52

Client Information

Client: ~~Jacobs~~ Arcadis
Address: 482 Congress St. Suite 501
Portland, ME 04084
Phone: 207-828-0046
Fax: 207-828-0062
Email: Mitch.Wedemeyer@arcadis-us.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: UniFirst Wells G&H
Project Location: Woburn, MA
Project #: MA000909.0002.00003
Project Manager: Nadine Weinberg
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX
☐ ADEx
Criteria Checker:
(Default based on Regulatory Criteria Indicated)
Other Formats:
☐ EMAIL (standard pdf report)
☐ Additional Deliverables:
Report to: (if different than Project Manager)

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

Other Project Specific Requirements/Comments:

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date (start / end)	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	Can ID	Flow Controller ID	TO-14A by TO-15	TO-15	TO-15 SIM APH	FIXED GASES	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)
8884.1	AA-10M-1-06162011	6/16 / 6/17	1702	1713	-29.8"	-10.4"	AA	MW	6L	998	077			X				
2	IA-10M-2-06162011	6/16 / 6/17	1707	1657	-30	-8.6"	AA	MW	6L	959	248			X				
3	IA-10M-1-06162011	6/16 / 6/17	1711	1648	-29.9"	-6.95"	AA	MW	6L	1592	168			X				
4	DUP IA-0616 2011	6/16 / 6/17	—	—	-30"	-4.5"	AA	MW	6L	640	286			X				
5	SS-10M-1-06172011	6/17	1708	1738	-30"	-6"	SV	MW	6L	1568	245			X				
6	SS-10M-2-06172011	6/17	~~1644~~ 1725	1755	-30"	-6.7"	SV	MW	6L	1644	274			X				
7	TB06182011	6/18	—	—	—	—	AA	MW	6L	1711	373			X				
	AA-CP-1-06182011	6/18	0305	1454	-30"	-4.4"	AA	MW	6L	947	071			X				
	AA-CP-2-06182011	6/18	~~0305 -30"~~	1452	-30"	-4.5"	AA	MW	6L	1688	326			X				
	IA-CP-1-06182011	6/18	~~0200 -30"~~	1503	-30"	-5.8"	AA	MW	6L	1053	147			X				

*SAMPLE MATRIX CODES
AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

Container Type

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

Relinquished By:	Date/Time	Received By:	Date/Time:
[signature]	6/18/2011 1700	[signature]	6/20/11 11
Pat Catino	6/21/11 820	[signature]	6/20/11 1700
		Pat Catino	6/21/11 701
		[signature]	6/21/11 820

Form No: 101-02 (19-Jun-09)

AIR ANALYSIS

PAGE 1 OF _____

CHAIN OF CUSTODY

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #:

Serial_No:07051113:52

Client Information

Client: Arcadis

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name:

Project Location: Unifirst SU1

Project #:

Project Manager:

ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH *(only confirmed if pre-approved!)*

Date Due: Time:

Report Information - Data Deliverables

☐ FAX
☐ ADEx
Criteria Checker: _____
(Default based on Regulatory Criteria Indicated)
Other Formats: _____
☐ EMAIL (standard pdf report)
☐ Additional Deliverables: _____

Report to: *(if different than Project Manager)*

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

Bar. Pres. - 29.88

Other Project Specific Requirements/Comments:

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	ID Can	ID - Flow Controller	ANALYSIS: TO-14A by TO-15	TO-15	TO-15 SIM	APH	FIXED GASES	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)
	Can 959 FC 248	6/13/11			-29.4		AA												
	Can 1592 FC 168				-29.4														
	Can 648 FC 129				-29.4														
	Can 1691 FC 149				-29.4														
	Can 1688 FC 326				-29.4														
	Can 947 FC 071				-29.4														
	Can 640 FC 286				-29.4														
	Can 1619 FC 229				-29.4														
	Can 643 FC 359				-29.4														
	Can 995 FC 481				-29.4														

SAMPLE MATRIX CODES
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Other = Please Specify

Container Type

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Relinquished By:	Date/Time	Received By:	Date/Time:
Kim Foss	6/13/11 16:20	P. Gilbert	6/13/11 1620
P. Gilbert	6/13/11 1655		6/13/11 1655
	6/13/11 1655		6-14-11 1050
Brian Anderson	6-14-11		6-14-11 1315

Form No: 101-02 (19-Jun-09)

AIR ANALYSIS

PAGE 2 OF _____

CHAIN OF CUSTODY

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: _____ ALPHA Job #: _____

Serial No:07051113:52

Client Information

Client: Arcadis
Address:
Phone:
Fax:
Email:
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name:
Project Location: Unifirst SU1
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX
☐ ADEx
Criteria Checker:
(Default based on Regulatory Criteria Indicated)
Other Formats:
☐ EMAIL (standard pdf report)
☐ Additional Deliverables:
Report to: (if different than Project Manager)

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

Other Project Specific Requirements/Comments:

All Columns Below Must Be Filled Out

ANALYSIS

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-14A by TO-15	TO-15	TO-15 SIM	APH	FIXED GASES	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)
	Can 998 FC 077	6/13/11			-29.4		AA												
	Can 987 FC 500				-29.4														
	Can 1053 FC 147				-29.4														
	Can 1711 FC 373				-29.4														
	Can 575 FC 152				-29.4														
	Can 589 FC 367				-29.4														
	Can 901 FC 131				-29.4														
	Can 6860 FC 192				-29.4														
	Can 16066 FC 298				-29.4		SV												
	Can 1587 FC 357				-29.4														

*SAMPLE MATRIX CODES: AA = Ambient Air (Indoor/Outdoor); SV = Soil Vapor/Landfill Gas/SVE; Other = Please Specify

Container Type

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

Relinquished By:	Date/Time	Received By:	Date/Time:
[signature]	6/13/11 16:20	[signature]	6/13/11 1620
[signature]	6/13/11 1655	[signature]	6/13/11 1655
[signature]	6/13/11 1655	[signature]	6-14-11 1030
[signature]	6-14-	[signature]	6-14-11 1315

Form No: 101-02 (19-Jun-09)

AIR ANALYSIS

PAGE 3 OF _____

ALPHA ANALYTICAL

CHAIN OF CUSTODY

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Serial_No:07051112:52

Client Information

Client: Arcadis
Address:
Phone:
Fax:
Email:
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name:
Project Location: Unifirst SU1
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH *(only confirmed if pre-approved!)*
Date Due: **Time:**

Date Rec'd in Lab:

Report Information - Data Deliverables

☐ FAX
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Criteria Checker: _____
(Default based on Regulatory Criteria Indicated)
Other Formats: _____
☐ EMAIL (standard pdf report)
☐ Additional Deliverables: _____
Report to: *(if different than Project Manager)*

ALPHA Job #:

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

Other Project Specific Requirements/Comments:

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	ANALYSIS: TO-14A by TO-15	TO-15	TO-15 SIM	APH	FIXED GASES	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)
	Can 742 FC 223	6/13/11			-29.4		SV												
	Can 748 FC 391				-29.4														
	Can 1658 FC 073				-29.4														
	Can 1644 FC 279				-29.4														
	Can 1669 FC 353				-29.4														
	Can 1568 FC 295				-29.4														
	Can 1672 FC 293				-29.4														
	Can 1565 FC 052				-29.4														
	~~Can 1695 FC 300~~				-29.4														(LB) 6/13/11

*SAMPLE MATRIX CODES: AA = Ambient Air (Indoor/Outdoor); SV = Soil Vapor/Landfill Gas/SVE; Other = Please Specify

Container Type

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

Relinquished By:	Date/Time	Received By:	Date/Time:
[signature]	6/13/11 16:20	P. Gilbert	6/13/11 1620
P. Gilbert	6/13/11 1655	[signature]	6/13/11 1655
[signature]	6/13/11 1655	[signature]	6-14-11 1020
[signature]	6-14-11	[signature]	6-14-11 1315

Form No: 101-02 (19-Jun-09)

only half seal on crate. Covering seam.

same as above

ARCADIS

Appendix E

Preliminary Human Health Risk Evaluation Report

ARCADIS
Infrastructure · Water · Environment · Buildings

Imagine the result

UniFirst Corporation

Appendix E

Human Health Risk Evaluation Report – Second Sampling Round

Residence, Parcel 26/ 05/ 04
Wells G&H Superfund Site
Woburn, Massachusetts

August 2011

Appendix E
Human Health Risk Evaluation Report – Second Sampling Round

Residence, Parcel 26/ 05/ 04
Wells G&H Superfund Site
Woburn, Massachusetts

Prepared for:
UniFirst Corporation

Prepared by:
ARCADIS U.S., Inc.
482 Congress St
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Tel 207.828.0046
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Our Ref.:
MA000989.0002

Date:
August 2011

ARCADIS

Table of Contents

1. Introduction

ARCADIS has prepared a preliminary human health risk assessment based upon validated indoor air data presented in Table 1 of the Indoor Air Quality and Vapor Intrusion Assessment: Report of Second Round of Sampling Results from samples collected on June 17, 2011 at the residence at Woburn Parcel Number 26/05/04 (the Residence). The list of compounds of potential concern (COPCs) is in accordance with Table 1 of the *Indoor Air Quality and Vapor Intrusion Assessment Scope of Work* (SOW) (The Johnson Company [JCO] 2010a) submitted to the U.S. Environmental Protection Agency (USEPA) by The Johnson Company on behalf of the UniFirst Corporation in March 2010 and Table 2 of *Indoor Air Quality and Vapor Intrusion Assessment: Report of Results* (IAQA/VI) (JCO 2010b). COPCs that were detected in any indoor air sample were considered in the risk assessment.

2. Comparison to Acute Exposure Criteria

In order to screen for potential near-term human health hazards, indoor air data from June 2011 were compared to two sets of acute exposure criteria, including Acute Minimal Risk Levels (MRLs) and Acute Exposure Guideline Levels (AEGLs). In addition, indoor air data were compared to occupational criteria, including Permissible Exposure Limits (PELs) and Threshold Limit Values (TLVs®) (Table 1). Acute inhalation MRLs are derived by the Agency for Toxic Substances and Disease Registry (ATSDR) for noncarcinogenic effects from exposures lasting 14 days or less. AEGLs are set by USEPA for infrequent or one-time exposures to airborne compounds. An eight-hour AEGL-1 represents a level above which it is expected that the general population could experience significant but reversible irritation or discomfort. PELs are federal standards enforceable by the Occupational Safety and Health Administration (OSHA) for an eight-hour time-weighted average occupational exposure. TLVs® are eight-hour time-weighted averages proposed by the American Conference of Governmental Industrial Hygienists (ACGIH) for occupational hazard assessment. If no acute exposure criteria or occupational criteria were available for a given compound, surrogate values were used where appropriate (Table 1). Comparisons were based on individual samples (i.e., assuming that an individual person would consistently remain at the sample location throughout the relevant exposure period).

No June 2011result exceeded acute exposure criteria. Thus, acute indoor air exposures to the COPCs would not pose significant risks of harm to human health.

3. Risk Evaluation

Indoor air and outdoor air samples were collected at the Residence on June 16 and 17, 2011. Subslab soil vapor samples were collected on June 17, 2011. The indoor air samples were collected at two locations in the basement of the Residence. Analytical results indicate that 14 constituents were detected in indoor air (Table 2). Of these 14 constituents, 1,2-dichloroethane, 1,3-butadiene, 1,4-dichlorobenzene, benzene, ethylbenzene, methylene chloride, naphthalene, and trichloroethene were detected only in indoor air and not in sub-slab soil vapor, indicating that concentrations detected were associated with background sources.

Six of the 14 constituents detected in indoor air were detected in sub-slab soil vapor, including 1,2,4-trimethylbenzene, carbon tetrachloride, chloroform, tetrachloroethene, toluene, and xylenes (Table 2). Calculated attenuation factors (AF) were equal to or above 1.0 for all constituents other than tetrachloroethene (PCE) (Table 2). These results indicate that indoor air concentrations exceed sub-slab soil vapor concentrations, and a background source is the primary source of the detected indoor air constituents. The data also show that carbon tetrachloride was detected at a similar concentration in outdoor air collected upwind of the home, as compared to indoor air. These data suggest that the primary source of carbon tetrachloride in indoor air may be from outdoor air.

During pre-sampling activities, ARCADIS staff conducted a building survey to document building conditions and products that were found in the basement of the Residence. Since indoor air sampling was only conducted in the basement, the survey was not extended to the first floor or garage, where additional background sources of some chemicals may be located. The following potential background sources were identified during the survey:

- Field staff noted a car in the attached garage. This is likely a source of concentrations of the petroleum constituents benzene, ethylbenzene, toluene, xylenes (BTEX), naphthalene, and 1,2,4-trimethylbenzene detected in indoor air.

- The home owner is a known smoker and during a previous sampling round was seen smoking a cigarette in the basement of the home. Cigarette smoke may be a source of benzene, toluene, 1,3-butadiene, and naphthalene (http://www.epa.gov/ttnatw01/hlthef/).

- Bottles of bleach were noted in the basement during the site visit which may be sources of chloroform via reactions with other cleaning products (Odabasi 2008).

Risks from inhalation of volatile organic compounds in indoor air were estimated for a current resident for both long- and short-term exposures. Exposure assumptions were based on current USEPA guidance (USEPA 2009) (Table 3).

In accordance with USEPA guidance, long-term exposure was defined as 30 years for a current resident. The short-term exposure was performed for a five-year exposure in accordance with Massachusetts Department of Environmental Protection (MADEP) guidance for Imminent Hazard (IH) evaluations to determine if an IH condition existed as defined in the Massachusetts Contingency Plan (MCP) (MADEP 2008). As specified in the MCP, the IH evaluation was performed for current use receptors: current residents.

For each constituent, the exposure point concentration in indoor air is equal to the average concentration of the two indoor air results. Residents were assumed to be present 24 hours per day in the building. Exposure parameters for each scenario are presented in Table 3.

Risks were estimated according to USEPA guidance (USEPA 2009) and the MCP (MADEP 2008). Volatile organic compounds in indoor air were not considered to pose significant cumulative risk to human health within or below the USEPA Superfund target excess lifetime cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ for potential carcinogenic effects and a target Hazard Index (HI) of 1 for potential noncarcinogenic effects. The criteria applicable to the MADEP IH evaluation are a target excess lifetime cancer risk of $1x10^{-5}$ for potential carcinogenic effects and a target Hazard Index (HI) of 1 for potential noncarcinogenic effects.

The risk assessment was executed on all constituents that were detected in at least one indoor air sample, including several constituents that have been demonstrated *not* to be site-related. 1,2,4-Trimethylbenzene, carbon tetrachloride, chloroform, toluene and xylenes were all detected at higher concentrations in indoor air than sub-slab soil vapor. Carbon tetrachloride was detected at a similar concentration in outdoor air compared to indoor air. 1,2,4-Trimethylbenzene, carbon tetrachloride, chloroform, toluene, and xylenes were also detected in outdoor air, so ambient air may have contributed to background. 1,2-Dichloroethane, 1,3-butadiene, 1,4-dichlorobenzene, methylene chloride, and trichloroethene were not detected in sub-slab soil vapor or

outdoor air, indicating a source inside the Residence. Benzene, ethylbenzene, and naphthalene were detected in indoor air and ambient air, but not in sub-slab soil vapor, suggesting an outside background source. These constituents are present as a result of sources within or outside the building and are not within the scope of a release to the environment addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Risks from an initial sampling event at this property (March 11 and 12, 2011) were presented in Appendix E of the Indoor Air Quality and Vapor Intrusion Assessment: Report of Results submitted to USEPA on April 29, 2011. To evaluate potential risks from both the initial sampling event (March 11 and 12, 2011) and the second round of samples (June 16 and 17, 2011) risks were calculated considering chemicals detected in indoor air from both events. Any constituent that was detected in indoor air in either March or June was included in the combined risk calculation. Risks were estimated using the average concentration from both sampling rounds. Risks associated with both data sets are referred to as "Combined Results" below.

4. Current Results

No indoor air sample exceeded acute exposure criteria or occupational criteria, and acute indoor air exposures to the COPCs are not estimated to pose significant risks to human health.

4.1 Current Resident (Short-Term)

As presented in Table 4, the cumulative estimated lifetime cancer risks for a short-term (5-year) exposure period to a current resident exposed to the COPCs detected in indoor air in the Residence did not exceed the MADEP IH target risk level of $1x10^{-5}$ (Table 4). Non-cancer hazards are equal to 0.8 for this exposure scenario. No IH condition as defined by the MCP was found to exist at the Residence for the short-term resident exposure scenario.

All risks to COPCs in indoor air were within the Superfund target excess lifetime cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ and no individual chemical risks exceeded $4x10^{-6}$ (Table 4). It should be noted that the majority of risk (72%) was due to exposure to chloroform and naphthalene which are likely to be present in indoor air from background sources. Risks associated with PCE only account for 5% of the total risk, or an estimated risk level of $3x10^{-7}$.

4.2 Current Resident (Long-Term)

Cumulative estimated cancer risks for a long-term (30-year) exposure period to a current resident exposed to COPCs in indoor air were within the Superfund target excess lifetime cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ (Table 5). All non-cancer hazards are equal to 0.8 for this exposure scenario (Table 5). Chloroform and naphthalene continue to drive the estimated cancer risk level, making up 72% of risk. The risk associated with exposure to PCE in indoor air is $2x10^{-6}$ for the long term current resident.

5. Combined Results

The results from the March 2011 and June 2011 data were combined to determine the potential overall risk from exposure to constituents detected in indoor air.

5.1 Current Resident (Short-Term)

Table 6 presents the results of the combined indoor air data evaluation. The cumulative estimated lifetime cancer risks for a short-term (5-year) exposure period to a current resident exposed to the COPCs detected in indoor air from March and June 2011 in the Residence did not exceed the MADEP IH target risk level of $1x10^{-5}$ (Table 6). Non-cancer hazards for the combined results are equal to 1 for this exposure scenario due mostly to 1,2,4-trimethylbenzene and naphthalene. No IH condition as defined by the MCP was found to exist at the Residence for the short-term resident exposure scenario.

All risks to COPCs in indoor air from the combined results were within the Superfund target excess lifetime cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ and no individual chemical risks exceeded $3x10^{-6}$ (Table 6). It should be noted that the majority of risk (76%) from the combined results was due to exposure to benzene, chloroform, and naphthalene which are likely to be present in indoor air from background sources. Risks associated with PCE only account for 4% of the total risk, or an estimated risk level of $3x10^{-7}$ over both events.

5.2 Current Resident (Long-Term)

Cumulative estimated cancer risks for a long-term (30-year) exposure period to a current resident exposed to COPCs in indoor air from the combined results were within the Superfund target excess lifetime cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ (Table 7). All

non-cancer hazards are equal to 1 for this exposure scenario (Table 7) driven primarily from 1,2,4-trimethylbenzene and naphthalene. Benzene, chloroform, and naphthalene continue to drive the estimated risk level, making up 76% of risk. The risk associated with exposure to PCE in indoor air from the combined results is $2x10^{-6}$ for the long term current resident.

6. Conclusions and Recommendations

In the June 2011 sampling round, no indoor air sample exceeded acute exposure criteria or occupational criteria, and acute indoor air exposures to the COPCs are not estimated to pose significant risks to human health. Cumulative estimated carcinogenic and noncarcinogenic risks for current residents did not exceed target risk levels for a short-term (5-year) exposure period. No IH condition as defined by the MCP was found to exist at the Residence.

Long term estimated excess lifetime carcinogenic risks for current residents (30 years) to June 2011 data are all within the Superfund target excess lifetime cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ considering average indoor air concentrations and do not exceed $4x10^{-5}$ under any exposure scenario. All non-cancer HIs are equal to 0.8. All supporting risk assessment tables are provided in Attachment A.

PCE was detected in the June 2011 sampling round at low levels (0.739 to 0.841 $\mu g/m^3$) that are consistent with background sources in residences throughout the United States. USEPA's indoor air background database reported a 50^{th} percentile value of 0.7 $\mu g/m^3$, a 75^{th} percentile value of 1.4 $\mu g/m^3$, and a 90^{th} percentile value of 3.8 $\mu g/m^3$ for PCE (Dawson 2008). The potential carcinogenic risk level estimated for the low levels of PCE detected in the Residence is $2x10^{-6}$ for long term exposure, a level of risk at the most conservative end of USEPA's risk range for Superfund sites. The estimated total risk, including exposure to other compounds in the Residence originating from background sources, is $4x10^{-5}$, primarily due to chloroform and naphthalene. The PCE concentrations measured in the Residence are also below the MADEP Threshold Value (TV) for PCE (1.4 $\mu g/m^3$). According to MADEP, when compounds of concern are measured in indoor air at levels that are below TVs, it can reasonably be concluded that a complete vapor intrusion pathway does not exist.

The risk evaluation of the combined data confirms the results reported above and in the previous (April 29, 2011) human health risk assessment. Using all the data, the overall risk level was similar to the current data set. In all cases, background constituents (i.e., benzene and naphthalene in March 2011 and benzene, chloroform,

and naphthalene in June 2011) are the primary risk drivers in indoor air. These constituents, however, were either not detected in sub-slab soil vapor, or detected at lower concentrations in sub-slab soil vapor compared to indoor air (see Section 3.3 of the Indoor Air Quality and Vapor Intrusion Assessment). In contrast, PCE only accounts for a small percentage (4%) of the overall risk level. Concentrations of background constituents detected in indoor air were slightly higher in the March 2011 sampling event than in the June 2011 event. Concentrations of PCE in indoor air were similar in both events (i.e., March 2011 PCE average = 0.57 $\mu g/m^3$; June 2011 PCE average = 0.76 $\mu g/m^3$).

7. References

Dawson, Helen. 2008. Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences. Literature Review & Implications for Vapor Intrusion Assessment. Vapor Intrusion Workshop – AEHS Spring 2008, San Diego, California.

Massachusetts Department of Environmental Protection (MADEP). 2008. Massachusetts Contingency Plan, 310 CMR 40.0000. Bureau of Waste Site Cleanup. February.

Odabasi, M., 2008. Halogenated Volatile Organic Compounds from the Use of Chlorine-Bleach-Containing Household Products. Environ. Sci. Technol. 42:1445-1451.

The Johnson Company (JCO). 2010a. Indoor Air Quality and Vapor Intrusion Assessment Scope of Work, Revision 2, UniFirst Property, Wells G&H Superfund Property. March 25.

JCO. 2010b. Indoor Air Quality and Vapor Intrusion Assessment Report of Results, UniFirst Property, Wells G&H Superfund Property. June 18.

U.S. Environmental Protection Agency (USEPA). 2009. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). Office of Superfund Remediation and Technology Innovation. EPA-540-R-070-002. January.

ARCADIS

Table 1. Acute and Occupational Exposure Criteria for COPCs Detected in Indoor Air

Compound	ATSDR MRL	USEPA AEGL	OSHA PEL	ACGIH TLV
1,2,4-Trimethylbenzene	NA	2.21E+05	NA	1.23E+05
1,2-Dichloroethane	NA	NA	2.02E+05	NA
1,3-Butadiene	2.21E+02	1.48E+06	2.21E+03	4.42E+03
1,4-Dichlorobenzene	1.20E+04	NA	2.71E+06	6.01E+04
Benzene	2.87E+01	2.87E+04	3.19E+04	1.60E+03
Carbon tetrachloride	NA	1.20E+05	6.30E+04	3.15E+04
Chloroform	4.87E+02	1.41E+05	2.40E+05	4.87E+04
Ethylbenzene	4.34E+04	1.43E+05	4.35E+05	4.34E+05
Methylene chloride	2.09E+03	2.09E+05	8.69E+04	1.74E+05
Naphthalene	NA	NA	5.00E+04	5.24E+04
Toluene	3.76E+03	7.53E+05	7.53E+05	7.53E+04
Xylenes	8.67E+03	5.64E+05	4.35E+05	4.34E+05

Notes:

All levels in $\mu g/m^3$. Levels reported in parts per million (ppm) were first converted to mg/m^3: (level in ppm)*(molecular weight)/24.45.

COPC = compound of potential concern

NA = value not available

ATSDR MRL = Agency for Toxic Substances and Disease Registry Minimum Risk Level (acute inhalation exposure)

USEPA AEGL = US Environmental Protection Agency Acute Exposure Guideline Level (8-hour AEGL 1; AEGL 2 if AEGL 1 not reported).

OSHA PEL = Occupational Safety and Health Administration Permissible Exposure Limits (29 CFR 1910 Subpart Z)

ACGIH TLV = American Conference of Governmental Industrial Hygienists Threshold Limit Value® (time-weighted average)

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Table 2. Residential Indoor Air and Sub-slab Soil Vapor Data with Attenuation Factors

Sample Name: / Date Collected:	Units	IA-1 6/17/2011	IA-2 6/17/2011	Average Detected Concentration Indoor Air	SS-1 6/17/2011	SS-2 6/17/2011	Average Detected Concentration Sub-Slab Soil Vapor	AA-1 6/17/2011	Average Attenuation Factor (a)
1,1,1-Trichloroethane	µg/m^3	0.109 U [0.109 U]	0.109 U	ND	0.153	0.147	0.15	0.109 U	NA
1,1,2-Trichloroethane	µg/m^3	0.109 U [0.109 U]	0.109 U	ND	0.109 U	0.109 U	ND	0.109 U	NA
1,1-Dichloroethane	µg/m^3	0.081 U [0.081 U]	0.081 U	ND	0.081 U	0.081 U	ND	0.081 U	NA
1,1-Dichloroethene	µg/m^3	0.079 U [0.079 U]	0.079 U	ND	0.079 U	0.079 U	ND	0.079 U	NA
1,2,4-Trimethylbenzene	µg/m^3	1.48 [1.56]	1.26	1.39	0.118	0.192	0.16	0.27	9
1,2-Dibromoethane	µg/m^3	0.154 U [0.154 U]	0.154 U	ND	0.154 U	0.154 U	ND	0.154 U	NA
1,2-Dichloroethane	µg/m^3	0.138 [0.138]	0.13	0.134	0.081 U	0.081 U	ND	0.081 U	NA
1,2-Dichloropropane	µg/m^3	0.092 U [0.092 U]	0.092 U	ND	0.092 U	0.092 U	ND	0.092 U	NA
1,3-Butadiene	µg/m^3	0.106 J [0.108 J]	0.15 J	0.129	0.044 UJ	0.044 UJ	ND	0.044 UJ	NA
1,3-Dichlorobenzene	µg/m^3	0.12 U [0.12 U]	0.12 U	ND	0.12 U	0.12 U	ND	0.12 U	NA
1,4-Dichlorobenzene	µg/m^3	0.168 [0.12 U]	0.12 U	**0.168**	0.12 U	0.12 U	ND	0.12 U	NA
Benzene	µg/m^3	0.732 [0.767]	0.728	0.739	0.224 U	0.224 U	ND	0.316	NA
Bromodichloromethane	µg/m^3	0.134 U [0.134 U]	0.134 U	ND	0.134 U	0.134 U	ND	0.134 U	NA
Bromoform	µg/m^3	0.207 U [0.207 U]	0.207 U	ND	0.207 U	0.207 U	ND	0.207 U	NA
Carbon Tetrachloride	µg/m^3	0.447 [0.472]	0.459	0.459	0.377	0.409	0.39	0.453	1.2
Chlorobenzene	µg/m^3	0.092 U [0.092 U]	0.092 U	ND	0.092 U	0.092 U	ND	0.092 U	NA
Chloroform	µg/m^3	0.591 [0.571]	0.493	0.537	0.195	0.098 U	**0.20**	0.137	3
cis-1,2-Dichloroethene	µg/m^3	0.079 U [0.079 U]	0.079 U	ND	0.079 U	0.079 U	ND	0.079 U	NA
Ethylbenzene	µg/m^3	0.738 J [0.747 J]	0.734 J	0.738	0.087 UJ	0.087 UJ	ND	0.2 J	NA
Isopropylbenzene	µg/m^3	2.46 U [2.46 U]	2.46 U	ND	2.46 U	2.46 U	ND	2.46 U	NA
Methyl tert-butyl ether	µg/m^3	0.072 UJ [0.072 UJ]	0.072 UJ	ND	0.072 UJ	0.072 UJ	ND	0.072 UJ	NA
Methylene Chloride	µg/m^3	21.1 J [2.78 J]	1.74 U	11.9	1.74 U	1.74 U	ND	1.74 U	NA
Naphthalene	µg/m^3	1.8 J [1.8 J]	1.45 J	1.63	0.262 UJ	0.262 UJ	ND	0.142 J	NA
Tetrachloroethene	µg/m^3	0.746 [0.841]	0.739	0.766	127	84.8	105.90	0.136 U	0.007
Toluene	µg/m^3	5.28 J [5.54 J]	4.22 J	4.82	0.188 UJ	0.241 J	**0.241**	1.22 J	20
trans-1,2-Dichloroethene	µg/m^3	0.079 U [0.079 U]	0.079 U	ND	0.079 U	0.079 U	ND	0.079 U	NA
trans-1,3-Dichloropropene	µg/m^3	0.091 U [0.091 U]	0.091 U	ND	0.091 U	0.091 U	ND	0.091 U	NA
Trichloroethene	µg/m^3	0.107 U [0.14]	0.107 U	**0.14**	0.107 U	0.107 U	ND	0.107 U	NA
Vinyl Chloride	µg/m^3	0.051 U [0.051 U]	0.051 U	ND	0.051 U	0.051 U	ND	0.051 U	NA
Xylenes (total)	µg/m^3	3.09 [3.25]	3.1	3.14	0.261 U	0.36	**0.36**	0.908	9

Notes:
(a) Attenuation Factor calculated as the ratio of the average detected indoor air to average detected sub-slab soil vapor concentration
U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit
µg/m^3 - Micrograms per cubic meter
IA - Indoor air sample
AA - Ambient air sample
SS - Sub-slab soil vapor sample
NA - Not applicable
ND - Not detected
[0.109 U] - Duplicate results presented in brackets
Bold - Value given is detected concentration only, as compound was detected in one sample only.

Table 3. Exposure Assumptions for the Estimation of Risks from Inhalation of Volatile Constituents in Indoor Air for a Resident

Parameter	Units	Resident – Short Term			Resident – Long Term		
		Value	Source	Comment	Value	Source	Comment
Exposure Time	hours/day	24	(a)		24	(a)	
Exposure Frequency	days/year	350	(a)		350	(a)	
Exposure Duration	years	5	(b)		30	(a)	
Averaging Time – Cancer	hours	613200	(a)		613200	(a)	
Averaging Time – Non-Cancer	hours	262800	(a)		262800	(a)	

Notes:
(a) USEPA 2009
(b) MADEP 2008

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Table 4. Estimated Risks to a Resident from Short Term Exposure to Volatile Constituents in Indoor Air via Inhalation

Parameter	Definition	Units	Value
ET	Indoor Air Exposure Time	hours/day	24
EF	Indoor Air Exposure Frequency	days/yr	350
ED	Indoor Air Exposure Duration	years	5
ATc	Indoor Air Averaging Time - Cancer	hours	613200
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800
CF	Conversion Factor	ug/mg	1000

Compound	EPC (a) Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	ADE-nc mg/m3	Cancer Risk Indoor Air (unitless)	HI Indoor Air (unitless)	% of Total Cancer Risk (unitless)	% of Total Noncancer HI (unitless)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	NA	NA
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,2,4-Trimethylbenzene	1.39E-03	0.007	NA	NA	1.33E-03	NA	0.2	NA	23%
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	NA	NA
1,2-Dichloroethane	1.34E-04	2.4	0.000026	9.18E-06	1.28E-04	2E-07	0.0001	4%	0.01%
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	NA	NA
1,3-Butadiene	1.29E-04	0.002	0.00003	8.80E-06	1.23E-04	3E-07	0.1	4%	7%
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,4-Dichlorobenzene	8.70E-05	0.8	0.000011	5.96E-06	8.34E-05	7E-08	0.0001	1%	0.01%
Benzene	7.39E-04	0.03	0.0000078	5.06E-05	7.08E-04	4E-07	0.02	6%	3%
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	NA	NA
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	NA	NA
Carbon tetrachloride	4.59E-04	0.1	0.000006	3.15E-05	4.40E-04	2E-07	0.004	3%	1%
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	NA	NA
Chloroform	5.37E-04	0.098	0.000023	3.68E-05	5.15E-04	8E-07	0.005	13%	1%
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	NA	NA
Ethylbenzene	7.38E-04	1	0.0000025	5.06E-05	7.08E-04	1E-07	0.001	2%	0.1%
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	NA	NA
Methylene chloride	6.41E-03	1	0.00000047	4.39E-04	6.14E-03	2E-07	0.01	3%	1%
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	NA	NA
Naphthalene	1.63E-03	0.003	0.000034	1.11E-04	1.56E-03	4E-06	0.5	59%	61%
Tetrachloroethene	7.66E-04	0.27	0.0000059	5.25E-05	7.35E-04	3E-07	0.003	5%	0.3%
Toluene	4.82E-03	5	NA	NA	4.62E-03	NA	0.001	NA	0.1%
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	NA	NA
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	NA	NA
Trichloroethene	7.51E-05	NA	0.000002	5.15E-06	NA	1E-08	NA	0.2%	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	NA	NA
Xylenes	3.14E-03	0.1	NA	NA	3.01E-03	NA	0.03	NA	4%
Total						6E-06	0.8	100%	100%

$$ADE = \frac{EPC_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{ADE}{RfC}$$

$$Risk = ADE \times URF \times CF$$

Notes:
(a) EPC calculated as average of detected concentrations and one-half indoor air detection limit for non-detects.
EC = exposure concentration
EPC - exposure point concentration
RfC - reference concentration
URF - unit risk factor
ADE-c - average daily exposure (cancer)
ADE-nc - average daily exposure (noncancer)
HI - noncancer hazard index
ug/mg3 - microgram per cubic milligram
NA - Not available
ND - Not detected
mg/m3 - milligram per cubic meter

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Table 5. Estimated Risks to a Resident from Long Term Exposure to Volatile Constituents in Indoor Air via Inhalation

Parameter	Definition	Units	Value
ET	Indoor Air Exposure Time	hours/day	24
EF	Indoor Air Exposure Frequency	days/yr	350
ED	Indoor Air Exposure Duration	years	30
ATc	Indoor Air Averaging Time - Cancer	hours	613200
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800
CF	Conversion Factor	ug/mg	1000

Compound	EPC (a) Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	ADE-nc mg/m3	Cancer Risk Indoor Air (unitless)	HI Indoor Air (unitless)	% of Total Cancer Risk (unitless)	% of Total Noncancer HI (unitless)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	ND	NA	1.60E-05	ND	ND	ND	ND	NA	NA
1,1-Dichloroethane	ND	NA	1.60E-06	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,2,4-Trimethylbenzene	1.39E-03	0.007	NA	NA	1.3E-03	NA	0.2	NA	23%
1,2-Dibromoethane	ND	0.009	6.00E-04	ND	ND	ND	ND	NA	NA
1,2-Dichloroethane	1.34E-04	2.4	2.60E-05	5.5E-05	1.3E-04	1E-06	0.0001	4%	0.01%
1,2-Dichloropropane	ND	0.004	1.00E-05	ND	ND	ND	ND	NA	NA
1,3-Butadiene	1.29E-04	0.002	3.00E-05	5.3E-05	1.2E-04	2E-06	0.1	4%	7%
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,4-Dichlorobenzene	8.70E-05	0.8	1.10E-05	3.6E-05	8.3E-05	4E-07	0.0001	1%	0.01%
Benzene	7.39E-04	0.03	7.80E-06	3.0E-04	7.1E-04	2E-06	0.02	6%	3%
Bromodichloromethane	ND	NA	3.70E-05	ND	ND	ND	ND	NA	NA
Bromoform	ND	NA	1.10E-06	ND	ND	ND	ND	NA	NA
Carbon tetrachloride	4.59E-04	0.1	6.00E-06	1.9E-04	4.4E-04	1E-06	0.004	3%	0.5%
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	NA	NA
Chloroform	5.37E-04	0.098	2.30E-05	2.2E-04	5.1E-04	5E-06	0.005	13%	0.6%
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	NA	NA
Ethylbenzene	7.38E-04	1	2.50E-06	3.0E-04	7.1E-04	8E-07	0.001	2%	0.1%
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	NA	NA
Methyl tert butyl ether	ND	3	2.60E-07	ND	ND	ND	ND	NA	NA
Methylene chloride	6.41E-03	1	4.70E-07	2.6E-03	6.1E-03	1E-06	0.006	3%	0.7%
Naphthalene	1.63E-03	0.003	3.40E-05	6.7E-04	1.6E-03	2E-05	0.5	59%	61%
Tetrachloroethene	7.66E-04	0.27	5.90E-06	3.1E-04	7.3E-04	2E-06	0.003	5%	0.3%
Toluene	4.82E-03	5	NA	NA	4.6E-03	NA	0.001	NA	0.1%
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	NA	NA
trans-1,3-Dichloropropene	ND	0.02	4.00E-06	ND	ND	ND	ND	NA	NA
Trichloroethene	7.51E-05	NA	2.00E-06	3.09E-05	NA	6E-08	NA	0.2%	NA
Vinyl chloride	ND	0.1	4.40E-06	ND	ND	ND	ND	NA	NA
Xylenes	3.14E-03	0.1	NA	NA	3.0E-03	NA	0.03	NA	4%
Total						4E-05	0.8	100%	100%

$$ADE = \frac{EPC_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{ADE}{RfC}$$

$$Risk = ADE \times URF \times CF$$

Notes:

(a) EPC calculated as average of detected concentrations and one-half indoor air detection limit for non-detects.

EC = exposure concentration

EPC - exposure point concentration

RfC - reference concentration

URF - unit risk factor

ADE-c - average daily exposure (cancer)

ADE-nc - average daily exposure (noncancer)

HI - noncancer hazard index

ug/mg3 - microgram per cubic milligram

mg/m3 - milligram per cubic meter

NA - Not available

ND - Not detected

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Table 6. Estimated Risks to a Resident from Short Term Exposure to Volatile Constituents in Indoor Air via Inhalation - Combined Results

Parameter	Definition	Units	Value
ET	Indoor Air Exposure Time	hours/day	24
EF	Indoor Air Exposure Frequency	days/yr	350
ED	Indoor Air Exposure Duration	years	5
ATc	Indoor Air Averaging Time - Cancer	hours	613200
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800
CF	Conversion Factor	ug/mg	1000

Compound	EPC (a) Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	ADE-nc mg/m3	Cancer Risk Indoor Air (unitless)	HI Indoor Air (unitless)	% of Total Cancer Risk (unitless)	% of Total Noncancer HI (unitless)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	NA	NA
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,2,4-Trimethylbenzene	2.50E-03	0.007	NA	NA	2.39E-03	NA	0.3	NA	33%
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	NA	NA
1,2-Dichloroethane	8.73E-05	2.4	0.000026	5.98E-06	8.37E-05	2E-07	0.00003	2%	0.003%
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	NA	NA
1,3-Butadiene	2.24E-04	0.002	0.00003	1.54E-05	2.15E-04	5E-07	0.1	7%	11%
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,4-Dichlorobenzene	7.35E-05	0.8	0.000011	5.03E-06	7.05E-05	6E-08	0.0001	1%	0.009%
Benzene	3.17E-03	0.03	0.0000078	2.17E-04	3.04E-03	2E-06	0.1	25%	10%
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	NA	NA
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	NA	NA
Carbon tetrachloride	4.85E-04	0.1	0.000006	3.32E-05	4.65E-04	2E-07	0.005	3%	0.5%
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	NA	NA
Chloroform	4.84E-04	0.098	0.000023	3.31E-05	4.64E-04	8E-07	0.005	11%	0.5%
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	NA	NA
Ethylbenzene	1.62E-03	1	0.0000025	1.11E-04	1.55E-03	3E-07	0.002	4%	0.2%
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	NA	NA
Methylene chloride	4.05E-03	1	0.00000047	2.77E-04	3.88E-03	1E-07	0.004	2%	0.4%
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	NA	NA
Naphthalene	1.16E-03	0.003	0.000034	7.93E-05	1.11E-03	3E-06	0.4	40%	36%
Tetrachloroethene	6.68E-04	0.27	0.0000059	4.58E-05	6.41E-04	3E-07	0.002	4%	0.2%
Toluene	1.44E-02	5	NA	NA	1.38E-02	NA	0.003	NA	0.3%
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	NA	NA
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	NA	NA
Trichloroethene	6.43E-05	NA	0.000002	4.40E-06	NA	9E-09	NA	0.1%	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	NA	NA
Xylenes	8.57E-03	0.1	NA	NA	8.22E-03	NA	0.08	NA	8%
Total						7E-06	1	100%	100%

$$ADE = \frac{EPC_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{ADE}{RfC}$$

$$Risk = ADE \times URF \times CF$$

Notes:
(a) EPC calculated as average of detected concentrations and one-half indoor air detection limit for non-detects.
EC = exposure concentration
EPC - exposure point concentration
RfC - reference concentration
URF - unit risk factor
ADE-c - average daily exposure (cancer)
ADE-nc - average daily exposure (noncancer)
HI - noncancer hazard index
ug/mg3 - microgram per cubic milligram
NA - Not available
ND - Not detected
mg/m3 - milligram per cubic meter

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Table 7. Estimated Risks to a Resident from Long Term Exposure to Volatile Constituents in Indoor Air via Inhalation - Combined Results

Parameter	Definition	Units	Value
ET	Indoor Air Exposure Time	hours/day	24
EF	Indoor Air Exposure Frequency	days/yr	350
ED	Indoor Air Exposure Duration	years	30
ATc	Indoor Air Averaging Time - Cancer	hours	613200
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800
CF	Conversion Factor	ug/mg	1000

Compound	EPC (a) Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	ADE-nc mg/m3	Cancer Risk Indoor Air (unitless)	HI Indoor Air (unitless)	% of Total Cancer Risk (unitless)	% of Total Noncancer HI (unitless)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	ND	NA	1.60E-05	ND	ND	ND	ND	NA	NA
1,1-Dichloroethane	ND	NA	1.60E-06	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,2,4-Trimethylbenzene	2.50E-03	0.007	NA	NA	2.4E-03	NA	0.3	NA	33%
1,2-Dibromoethane	ND	0.009	6.00E-04	ND	ND	ND	ND	NA	NA
1,2-Dichloroethane	8.73E-05	2.4	2.60E-05	3.6E-05	8.4E-05	9E-07	0.00003	2%	0.003%
1,2-Dichloropropane	ND	0.004	1.00E-05	ND	ND	ND	ND	NA	NA
1,3-Butadiene	2.24E-04	0.002	3.00E-05	9.2E-05	2.2E-04	3E-06	0.1	7%	11%
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,4-Dichlorobenzene	7.35E-05	0.8	1.10E-05	3.0E-05	7.0E-05	3E-07	0.0001	1%	0.009%
Benzene	3.17E-03	0.03	7.80E-06	1.3E-03	3.0E-03	1E-05	0.1	25%	10%
Bromodichloromethane	ND	NA	3.70E-05	ND	ND	ND	ND	NA	NA
Bromoform	ND	NA	1.10E-06	ND	ND	ND	ND	NA	NA
Carbon tetrachloride	4.85E-04	0.1	6.00E-06	2.0E-04	4.6E-04	1E-06	0.005	3%	0.5%
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	NA	NA
Chloroform	4.84E-04	0.098	2.30E-05	2.0E-04	4.6E-04	5E-06	0.005	11%	0.5%
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	NA	NA
Ethylbenzene	1.62E-03	1	2.50E-06	6.7E-04	1.6E-03	2E-06	0.002	4%	0.2%
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	NA	NA
Methyl tert butyl ether	ND	3	2.60E-07	ND	ND	ND	ND	NA	NA
Methylene chloride	4.05E-03	1	4.70E-07	1.7E-03	3.9E-03	8E-07	0.004	2%	0.4%
Naphthalene	1.16E-03	0.003	3.40E-05	4.8E-04	1.1E-03	2E-05	0.4	40%	36%
Tetrachloroethene	6.68E-04	0.27	5.90E-06	2.7E-04	6.4E-04	2E-06	0.002	4%	0.2%
Toluene	1.44E-02	5	NA	NA	1.4E-02	NA	0.003	NA	0.3%
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	NA	NA
trans-1,3-Dichloropropene	ND	0.02	4.00E-06	ND	ND	ND	ND	NA	NA
Trichloroethene	6.43E-05	NA	2.00E-06	2.64E-05	NA	5E-08	NA	0.1%	NA
Vinyl chloride	ND	0.1	4.40E-06	ND	ND	ND	ND	NA	NA
Xylenes	8.57E-03	0.1	NA	NA	8.2E-03	NA	0.08	NA	8%
Total						4E-05	1	100%	100%

$$ADE = \frac{EPC_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{ADE}{RfC}$$

$$Risk = ADE \times URF \times CF$$

Notes:

(a) EPC calculated as average of detected concentrations and one-half indoor air detection limit for non-detects.

EC = exposure concentration

EPC - exposure point concentration

RfC - reference concentration

URF - unit risk factor

ADE-c - average daily exposure (cancer)

ADE-nc - average daily exposure (noncancer)

HI - noncancer hazard index

ug/mg3 - microgram per cubic milligram

mg/m3 - milligram per cubic meter

NA - Not available

ND - Not detected

A **A**

Risk Tables

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Short Term
Indoor Air
Volatilization from Indoor Air
0
Sample Location IA-01

Receptor:	Resident - Short Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	5	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	1.52E-03	0.007	NA	NA	NA	1.46E-03	0.2	NA	0.2
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1.38E-04	2.4	0.000026	9.45E-06	2E-07	1.32E-04	0.0001	2.E-07	0.0001
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	1.07E-04	0.002	0.00003	7.33E-06	2E-07	1.03E-04	0.1	2.E-07	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1.14E-04	0.8	0.000011	7.81E-06	9E-08	1.09E-04	0.0001	9.E-08	0.0001
Benzene	7.50E-04	0.03	0.0000078	5.13E-05	4E-07	7.19E-04	0.0	4.E-07	0.0
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.60E-04	0.1	0.000006	3.15E-05	2E-07	4.41E-04	0.004	2.E-07	0.004
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	5.81E-04	0.098	0.000023	3.98E-05	9E-07	5.57E-04	0.006	9.E-07	0.006
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	7.43E-04	1	0.0000025	5.09E-05	1E-07	7.12E-04	0.001	1.E-07	0.001
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	1.19E-02	1	0.00000047	8.18E-04	4E-07	1.14E-02	0.0114	4.E-07	0.0114
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	1.80E-03	0.003	0.000034	1.23E-04	4E-06	1.73E-03	0.6	4.E-06	0.6
Tetrachloroethene	7.94E-04	0.27	0.0000059	5.43E-05	3E-07	7.61E-04	0.003	3.E-07	0.003
Toluene	5.41E-03	5	NA	NA	NA	5.19E-03	0.001	NA	0.001
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	9.68E-05	NA	0.000002	6.63E-06	1E-08	NA	NA	1.E-08	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	3.17E-03	0.1	NA	NA	NA	3.04E-03	0.0	NA	0.03
Total					7E-06		1	7.E-06	1

NA - Not available
NC - Not calculated
ND - Not detected

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Long Term
Indoor Air
Volatilization from Indoor Air
0
Sample Location IA-01

Receptor:	Resident - Long Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	30	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	1.52E-03	0.007	NA	NA	NA	1.46E-03	0.2	NA	0.2
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1.38E-04	2.4	0.000026	5.67E-05	1E-06	1.32E-04	0.00006	1E-06	0.00006
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	1.07E-04	0.002	0.00003	4.40E-05	1E-06	1.03E-04	0.1	1E-06	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1.14E-04	0.8	0.000011	4.68E-05	5E-07	1.09E-04	0.00014	5E-07	0.00014
Benzene	7.50E-04	0.03	0.0000078	3.08E-04	2E-06	7.19E-04	0.0	2E-06	0.0
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.60E-04	0.1	0.000006	1.89E-04	1E-06	4.41E-04	0.004	1E-06	0.004
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	5.81E-04	0.098	0.000023	2.39E-04	5E-06	5.57E-04	0.006	5E-06	0.006
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	7.43E-04	1	0.0000025	3.05E-04	8E-07	7.12E-04	0.001	8E-07	0.001
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	1.19E-02	1	0.00000047	4.91E-03	2E-06	1.14E-02	0.0114	2E-06	0.0114
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	1.80E-03	0.003	0.000034	7.40E-04	3E-05	1.73E-03	0.6	3E-05	0.6
Tetrachloroethene	7.94E-04	0.27	0.0000059	3.26E-04	2E-06	7.61E-04	0.003	2E-06	0.003
Toluene	5.41E-03	5	NA	NA	NA	5.19E-03	0.001	NA	0.001
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	9.68E-05	NA	0.000002	3.98E-05	8E-08	NA	NA	8E-08	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	3.17E-03	0.1	NA	NA	NA	3.04E-03	0.0	NA	0.03
Total					4E-05		1	4E-05	1

NA - Not available
NC - Not calculated
ND - Not detected

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Short Term
Indoor Air
Volatilization from Indoor Air
0
Sample Location IA-02

Receptor:	Resident - Short Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	5	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	1.26E-03	0.007	NA	NA	NA	1.21E-03	0.2	NA	0.2
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1.30E-04	2.4	0.000026	8.90E-06	2E-07	1.25E-04	0.00005	2E-07	0.00005
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	1.50E-04	0.002	0.00003	1.03E-05	3E-07	1.44E-04	0.1	3E-07	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	6.00E-05	0.8	0.000011	4.11E-06	5E-08	5.75E-05	0.00007	5E-08	0.00007
Benzene	7.28E-04	0.03	0.0000078	4.99E-05	4E-07	6.98E-04	0.0	4E-07	0.0
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.59E-04	0.1	0.000006	3.14E-05	2E-07	4.40E-04	0.004	2E-07	0.004
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	4.93E-04	0.098	0.000023	3.38E-05	8E-07	4.73E-04	0.005	8E-07	0.005
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	7.34E-04	1	0.0000025	5.03E-05	1E-07	7.04E-04	0.001	1E-07	0.001
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	8.70E-04	1	0.00000047	5.96E-05	3E-08	8.34E-04	0.001	3E-08	0.001
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	1.45E-03	0.003	0.000034	9.93E-05	3E-06	1.39E-03	0.5	3E-06	0.5
Tetrachloroethene	7.39E-04	0.27	0.0000059	5.06E-05	3E-07	7.09E-04	0.003	3E-07	0.003
Toluene	4.22E-03	5	NA	NA	NA	4.05E-03	0.001	NA	0.001
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	5.35E-05	NA	0.000002	3.66E-06	7E-09	NA	NA	7E-09	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	3.10E-03	0.1	NA	NA	NA	2.97E-03	0.0	NA	0.03
Total					6E-06		1	6E-06	1

NA - Not available
NC - Not calculated
ND - Not detected

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Long Term
Indoor Air
Volatilization from Indoor Air
0
Sample Location IA-02

Receptor:	Resident - Long Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	30	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	1.26E-03	0.007	NA	NA	NA	1.21E-03	0.2	NA	0.2
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1.30E-04	2.4	0.000026	5.34E-05	1E-06	1.25E-04	0.00005	1E-06	0.00005
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	1.50E-04	0.002	0.00003	6.16E-05	2E-06	1.44E-04	0.1	2E-06	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	6.00E-05	0.8	0.000011	2.47E-05	3E-07	5.75E-05	0.00007	3E-07	0.00007
Benzene	7.28E-04	0.03	0.0000078	2.99E-04	2E-06	6.98E-04	0.0	2E-06	0.0
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.59E-04	0.1	0.000006	1.89E-04	1E-06	4.40E-04	0.004	1E-06	0.004
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	4.93E-04	0.098	0.000023	2.03E-04	5E-06	4.73E-04	0.005	5E-06	0.005
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	7.34E-04	1	0.0000025	3.02E-04	8E-07	7.04E-04	0.001	8E-07	0.001
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	8.70E-04	1	0.00000047	3.58E-04	2E-07	8.34E-04	0.001	2E-07	0.001
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	1.45E-03	0.003	0.000034	5.96E-04	2E-05	1.39E-03	0.5	2E-05	0.5
Tetrachloroethene	7.39E-04	0.27	0.0000059	3.04E-04	2E-06	7.09E-04	0.003	2E-06	0.003
Toluene	4.22E-03	5	NA	NA	NA	4.05E-03	0.001	NA	0.001
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	5.35E-05	NA	0.000002	2.20E-05	4E-08	NA	NA	4E-08	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	3.10E-03	0.1	NA	NA	NA	2.97E-03	0.0	NA	0.03
Total					3E-05		1	3E-05	1

NA - Not available
NC - Not calculated
ND - Not detected

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Short Term
Indoor Air
Volatilization from Indoor Air Combined Results
0
Sample Location IA-01

Receptor:	Resident - Short Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	5	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	2.70E-03	0.007	NA	NA	NA	2.59E-03	0.4	NA	0.4
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	8.93E-05	2.4	0.000026	6.11E-06	2E-07	8.56E-05	0.00004	2.E-07	0.00004
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	2.29E-04	0.002	0.00003	1.57E-05	5E-07	2.20E-04	0.1	5.E-07	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	8.70E-05	0.8	0.000011	5.96E-06	7E-08	8.34E-05	0.0001	7.E-08	0.0001
Benzene	3.34E-03	0.03	0.0000078	2.29E-04	2E-06	3.20E-03	0.1	2.E-06	0.1
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.97E-04	0.1	0.000006	3.40E-05	2E-07	4.76E-04	0.005	2.E-07	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	5.44E-04	0.098	0.000023	3.73E-05	9E-07	5.22E-04	0.005	9.E-07	0.005
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	1.62E-03	1	0.0000025	1.11E-04	3E-07	1.55E-03	0.002	3.E-07	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	6.41E-03	1	0.00000047	4.39E-04	2E-07	6.14E-03	0.006	2.E-07	0.006
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	1.35E-03	0.003	0.000034	9.21E-05	3E-06	1.29E-03	0.4	3.E-06	0.4
Tetrachloroethene	6.68E-04	0.27	0.0000059	4.57E-05	3E-07	6.40E-04	0.002	3.E-07	0.002
Toluene	1.51E-02	5	NA	NA	NA	1.45E-02	0.003	NA	0.003
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	7.51E-05	NA	0.000002	5.15E-06	1E-08	NA	NA	1.E-08	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	8.79E-03	0.1	NA	NA	NA	8.42E-03	0.1	NA	0.1
Total					7E-06		1	7.E-06	1

NA - Not available
NC - Not calculated
ND - Not detected

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Long Term
Indoor Air
Volatilization from Indoor Air Combined Results
0
Sample Location IA-01

Receptor:	Resident - Long Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	30	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	2.70E-03	0.007	NA	NA	NA	2.59E-03	0.4	NA	0.4
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	8.93E-05	2.4	0.000026	3.67E-05	1E-06	8.56E-05	0.00004	1E-06	0.00004
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	2.29E-04	0.002	0.00003	9.41E-05	3E-06	2.20E-04	0.1	3E-06	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	8.70E-05	0.8	0.000011	3.58E-05	4E-07	8.34E-05	0.0001	4E-07	0.0001
Benzene	3.34E-03	0.03	0.0000078	1.37E-03	1E-05	3.20E-03	0.1	1E-05	0.1
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.97E-04	0.1	0.000006	2.04E-04	1E-06	4.76E-04	0.005	1E-06	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	5.44E-04	0.098	0.000023	2.24E-04	5E-06	5.22E-04	0.005	5E-06	0.005
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	1.62E-03	1	0.0000025	6.66E-04	2E-06	1.55E-03	0.002	2E-06	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	6.41E-03	1	0.00000047	2.63E-03	1E-06	6.14E-03	0.0061	1E-06	0.0061
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	1.35E-03	0.003	0.000034	5.53E-04	2E-05	1.29E-03	0.4	2E-05	0.4
Tetrachloroethene	6.68E-04	0.27	0.0000059	2.74E-04	2E-06	6.40E-04	0.002	2E-06	0.002
Toluene	1.51E-02	5	NA	NA	NA	1.45E-02	0.003	NA	0.003
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	7.51E-05	NA	0.000002	3.09E-05	6E-08	NA	NA	6E-08	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	8.79E-03	0.1	NA	NA	NA	8.42E-03	0.1	NA	0.1
Total					4E-05		1	4E-05	1

NA - Not available
NC - Not calculated
ND - Not detected

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Short Term
Indoor Air
Volatilization from Indoor Air Combined Results
0
Sample Location IA-02

Receptor:	Resident - Short Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	5	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	2.29E-03	0.007	NA	NA	NA	2.20E-03	0.3	NA	0.3
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	8.53E-05	2.4	0.000026	5.84E-06	2E-07	8.17E-05	0.00003	2E-07	0.00003
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	2.21E-04	0.002	0.00003	1.51E-05	5E-07	2.12E-04	0.1	5E-07	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	6.00E-05	0.8	0.000011	4.11E-06	5E-08	5.75E-05	0.00007	5E-08	0.00007
Benzene	3.02E-03	0.03	0.0000078	2.07E-04	2E-06	2.89E-03	0.1	2E-06	0.1
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.75E-04	0.1	0.000006	3.25E-05	2E-07	4.55E-04	0.005	2E-07	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	4.20E-04	0.098	0.000023	2.87E-05	7E-07	4.02E-04	0.004	7E-07	0.004
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	1.57E-03	1	0.0000025	1.07E-04	3E-07	1.50E-03	0.002	3E-07	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	1.69E-03	1	0.00000047	1.15E-04	5E-08	1.62E-03	0.002	5E-08	0.002
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	9.74E-04	0.003	0.000034	6.67E-05	2E-06	9.34E-04	0.3	2E-06	0.3
Tetrachloroethene	6.71E-04	0.27	0.0000059	4.60E-05	3E-07	6.43E-04	0.002	3E-07	0.002
Toluene	1.33E-02	5	NA	NA	NA	1.28E-02	0.003	NA	0.003
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	5.35E-05	NA	0.000002	3.66E-06	7E-09	NA	NA	7E-09	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	8.25E-03	0.1	NA	NA	NA	7.91E-03	0.1	NA	0.1
Total					6E-06		1	6E-06	1

NA - Not available
NC - Not calculated
ND - Not detected

Table
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
UniFirst Corporation
Resident - Long Term
Indoor Air
Volatilization from Indoor Air Combined Results
0
Sample Location IA-02

Receptor:	Resident - Long Term
Medium of Origin:	Indoor Air
Exposure Medium:	Indoor Air
Exposure Area:	
Depth:	NA
Duration:	

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	30	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Riskinh	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	2.29E-03	0.007	NA	NA	NA	2.20E-03	0.3	NA	0.3
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	8.53E-05	2.4	0.000026	3.50E-05	9E-07	8.17E-05	0.00003	9E-07	0.00003
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	2.21E-04	0.002	0.00003	9.08E-05	3E-06	2.12E-04	0.1	3E-06	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	6.00E-05	0.8	0.000011	2.47E-05	3E-07	5.75E-05	0.00007	3E-07	0.00007
Benzene	3.02E-03	0.03	0.0000078	1.24E-03	1E-05	2.89E-03	0.1	1E-05	0.1
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.75E-04	0.1	0.000006	1.95E-04	1E-06	4.55E-04	0.005	1E-06	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	4.20E-04	0.098	0.000023	1.72E-04	4E-06	4.02E-04	0.004	4E-06	0.004
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	1.57E-03	1	0.0000025	6.44E-04	2E-06	1.50E-03	0.002	2E-06	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	1.69E-03	1	0.00000047	6.92E-04	3E-07	1.62E-03	0.002	3E-07	0.002
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	9.74E-04	0.003	0.000034	4.00E-04	1E-05	9.34E-04	0.3	1E-05	0.3
Tetrachloroethene	6.71E-04	0.27	0.0000059	2.76E-04	2E-06	6.43E-04	0.002	2E-06	0.002
Toluene	1.33E-02	5	NA	NA	NA	1.28E-02	0.003	NA	0.003
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	5.35E-05	NA	0.000002	2.20E-05	4E-08	NA	NA	4E-08	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	8.25E-03	0.1	NA	NA	NA	7.91E-03	0.1	NA	0.1
Total					4E-05		1	4E-05	1

NA - Not available
NC - Not calculated
ND - Not detected